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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CXXXVII., No. 2811.] TUESDAY, MARCH 27, 1917. [69TH YEAR.

EDITORIAL NOTES.

Three Months' Gas Coal Contracts—Important Notice.

THE Chairman of the Executive Committee of the National Gas Council (Mr. D. Milne Watson), we are informed, has had an interview with the Controller of Coal Mines on the question of the difficult position in which gas undertakings would be placed were they asked to enter into contracts for coal for a period of three instead of twelve months.

We understand that the Controller is writing to the Council shortly on the question, and that the present difficulty will be satisfactorily overcome.

Any contractor declining to make contracts as usual will be dealt with by the Controller.

The Government Payment for Benzol, Toluol, and Phenol.

IT would be idle to say that in the gas industry there is general satisfaction with its position in relation to the return that it is receiving for benzol, toluol, phenol, &c. Discontent has been simmering for some time in many quarters; and there is a very general feeling, patriotic as gas men are, that the appeal to their patriotism is only the pathway to an imposition on the industry which ought not to continue. There is no desire to harass the Explosives Supply Department of the Ministry of Munitions; but now that supplies of benzol, toluol, phenol, &c., are in full swing, though more is still wanted, the barest facts should suffice to satisfy the Department that there is very substantial reason for grievance on the part of the industry. The grievance has not generally been made public; but its existence is very real. Only recently [Feb. 13, p. 314] a paragraph appeared in the "JOURNAL" stating that the Stockton-on-Tees Corporation Gas Committee had had under consideration the fact that, notwithstanding Government requirements as to toluol, no payment was being made by the Government, or compensation given in any form, to the various gas-works. Where gas managers have been meeting together, there has been private talk of the inadequacy of the return for the materials that are being supplied. Managers of small gas-works have privately complained to us that they are in the hands of tar distillers, who will not give them anything for the additional richness imparted to their tar by the washing process. In fact, some of them might just as well throw away the tar as send it by rail to the tar distillers. That this condition of things has not been unknown to the Explosives Supplies Department of the Ministry of Munitions is plain from a remark that Mr. W. Doig Gibb made in his Presidential Address to the Southern District Association of Gas Engineers and Managers last year. He said: "I cannot con-
"ceive that any [Parliamentary] Committee in the future
"will find it possible, in reason, to object to giving per-
"mission to gas undertakings to make their own arrange-
"ments for dealing with residuals as they may think best.
"In this connection, there may yet be *some interesting evi-*
"dence given in regard to the relations between tar distillers and
"gas undertakings."

The time has come for a move to be made; and, in initiating such a move, Mr. Frank Livesey, of Maidstone, has taken a step which he hopes, and we hope, will be supported by engineers and managers of gas undertakings throughout the United Kingdom communicating with the National Gas Council, and each and all urging an investigation of the inadequate prices now being paid to gas undertakings for crude benzol, light oils, and naphthas, and requesting that an application be made for a substantial increase in the fixed prices. In the gas industry there has been much initiative, which has had lasting benefit, for which to thank the name of Livesey; and it is confidently hoped that this is yet another instance. The case that Mr. Livesey has laid before the National Gas Council is this week set forth in our "Correspondence" columns. It shows what is well known by gas men, but must be properly emphasized elsewhere, that the gas industry is paying very heavily for coal, oil, sulphuric acid, labour, and all else (some of which items have been Government "controlled" or neglected) that it regularly requires in its work and business; but—notwithstanding these outgoings, and the work that the industry is doing in extracting the requisites for high explosives—the Government "control" the prices for all these requisites in manner that the term "inadequate" is a very modest expression to apply to them. Having regard to the greater costs involved in gas manufacture, the prices paid for benzol, &c., ought to be considerably higher now than they were when it was not known how long the war was going to last, or how high was going to be the over-all cost of working. At the same time, the price of sulphate of ammonia is also "controlled" at a price that is low, having regard to the cost of sulphuric acid, labour, maintenance of plant, and much else, and a price that would not obtain were the markets open, and there was free competition for the produce. The gas industry is made to pay heavily one way; but restrictions are in almost every direction placed upon it in connection with its revenue-producing sources. These are the anomalous conditions that are helping to force the price of gas to high figures, and to force-down the rates of dividend to a level that is causing the gas industry to be looked upon as, during war time, an investment that should be shunned rather than courted.

We commend every line of Mr. Livesey's letter to the consideration of our readers; and that consideration we have no hesitation in believing will result in the managers of gas undertakings generally sending their individual request to the National Gas Council to move as is suggested. The Council cannot set aside a universal request; and if they approach the Ministry of Munitions representing the unanimous voice of the industry, the stronger would be the position, and the more likelihood of a good effect.

Small Works and Current Problems.

THE war, with its heavy claims and its responsibilities, is apt to make us look at, and to measure the importance of, things by magnitude. Up to a point, this is all right; but in being impressed by the major end, we must not fail to do justice to the minor end. In the matter, for instance, of the oil and tar washing of gas, and the supply of materials for explosives making, there cannot be, or there should not be, where there is real good work being done, any discrimination between the largest and the smallest works. The former make the greater contribution; the latter, the smaller. But it is only a question of the degree of opportunity, and not of will. The manager of the small works, given equal opportunity, would do precisely the same as the manager of the large works; and the manager of the small works who is doing the best possible deserves as much credit as the manager of the large works who is doing the same. It is clear from his Presidential Address to the Midland Association of Gas Managers on Thursday last that

Mr. George Stevenson, of Long Eaton, has a little feeling that the earnest work that is being done in some small concerns is apt to be lost sight of in face of the substantial results of the efforts of the large undertakings. This must not be. In this war every little helps—the ounces of crude benzol and toluol assist to make pounds; the pounds, the tons. Over 2,500,000 small investors helped, by means of War Savings Certificates, to swell the recent War Loan by £19,300,000 during the comparatively short period the lists remained open. We cannot afford to despise or ignore the small contributors of anything helpful in prosecuting the war to a successful issue. They are all wanted. The full weight of our ability and resources must be thrown into the scale. Mr. F. L. Halford and Mr. Doig Gibb, of the Explosives Supplies Department, have from time to time made this abundantly plain as far as gas-works are concerned. If we could total-up the contributions of the small works to the crude benzol and toluol supply, it would be seen that they make a quantity with which to-day the country could not afford to dispense.

The gas-works in the Midlands, large and small, have created a good record of service in this matter. With a "few notable exceptions" (among which one would rather not be), every gas-works within the ten counties whence the members of the Association are drawn is doing its "bit" willingly. That is the statement of Mr. Stevenson when, taking the opportunity of expressing his appreciation of what the large works are doing, he asked to be allowed to specially mention the work of the smaller undertakings, some of which were, when the call came, self-sacrificing in the national interest. "At an early period, when quickness "of adaptation was important, it is possible that the smaller "works were of supreme assistance in the situation." We quite believe that in some parts of the country they were; but in other quarters there was slow—terribly slow—appreciation of the grim necessity of countering the past neglect in this matter. Most of the smaller works are at present tar-washing, and not oil-washing. Here, again, while efforts have been made to get these undertakings to pass from the less efficient to the more efficient process, it is not universally the case that it is through any lack of willingness that they have not complied. The President makes the point. It is right it should be made. Plant, material, and labour are obstacles in the path of some of the managers of these works, as of the managers of larger works, entering upon the practice of oil-washing. They cannot get what is necessary to enable them to start the work. There are also managers who think their works are not large enough for the introduction of the oil-washing process. There are works where the plant conditions are not altogether favourable; but then there are many where they are. If Bordon, Petersfield, Crowborough, Godalming, Farnham, and other of the smaller works can oil-wash, then there are numerous others that could do the same. All honour to those, whether tar or oil washing, that are doing their maximum best. Now is the time to adopt the oil-washing process thoroughly and efficiently; for there is not the slightest question that the gas industry is generally, after the war, going to have benzol as a fresh source of revenue—a source of revenue that formerly made very limited contribution to the industry's funds.

The small gas-works must not be out of the development. They must be in it as well as the undertakings that stand higher in the scale of affluence. And this brings us to a question of policy. For many of the smaller works, the difference between success and failure may (says the President) depend upon their proximity to a rectification works. That is very true; and it is one reason why there has been in the columns of the "Journal" advocacy of co-operation in the establishment of central distilling plants, or co-operation between the smaller and the larger works, and why there have been suggestions as to organization with the view, by co-operation, of advancing and protecting the position of home-produced benzol after the war. Mr. Stevenson indirectly agrees with this advocacy and suggestion. "With so many scattered works," he says, "which by this "time will be equipped for producing the crude primary "products of tar distillation, the questions of central re-"fineries and commercial organization for their disposal "are all-important." He also suggests co-operative effort in the selling of the products, while in special cases it might readily be arranged for one central works to deal with the whole of the products of the district.

But who is going to take the lead in this matter? There have, as said, been advocacy and suggestions; but after them—silence. Whether any move is being made, we do not with any certainty know. We have understood that these are matters that are before the National Gas Council; but there is as yet no evidence from this direction of anything maturing in regard to them. It may be that in these matters the large undertakings with distilling plants are satisfied with their own position (present and prospective), and that the smaller undertakings must look after themselves. If this be the case, then the question may be repeated, Who is going to take the lead? But we can hardly think it is so. Of late years, the affairs of the gas industry have been dealt with from the point of view of oneness of interest. The National Gas Council is an embodiment of the ideal of oneness, just as is the Sulphate of Ammonia Association of the unity of interests of the whole of the producers of this particular commodity. Benzol extraction from town gas is a new development of rapid but permanent growth; and there are very good reasons why, through combination, there should be constant vigilance and ward maintained over the business now and in future. In the present many small works are not getting all the reward they should have; and after the war the Germans will be attempting to get back again one of the richest markets for benzol, and the American oil plutocrats will be seeing what they can do to keep benzol from serious competition with petrol. We hope some move will be made that will assure the maximum benefit from this business to the small as well as to the larger works engaging in it.

But while deliberating over developments, there must not be neglect of the movements in connection with the staple commodity. There is prudence in Mr. Stevenson's reference to the need, with a keen competitor in the field, for not allowing a high percentage of incombustible constituents to go out with the gas. We should say that, apart from the industry's direct interests, common honesty demands that the inert gases shall be kept down to the minimum. Agreement accompanies the President in his submission as to the need for the distribution of gas of constant composition and calorific value. Another point is that his district, with a large percentage of flat-flame burners in it, shows the need, in the fixing of standards, of the individual conditions of undertakings being considered. He submits that there is much to be said for a straight coal gas of 450 to 500 B.Th.U.—a fairly wide difference; and he cannot see any practical or economic prospect in his district for a gas much lower than this—if the quality is to remain at all constant. We see no reason why constant quality should not accompany a lower calorific power, if obtained by dilution with a strict proportion of simple water gas. The trial of unburnt limestone mixed with the retort charges, for improving the quality of both gas and tar, has—though Mr. Stevenson speaks well of the results so far as the primary objects are concerned—come to an end, through the development of corrosion on the inside of the retorts, which corrosion, however, may be due not to the action of the lime, but to the salty nature of the coal used. In an incidental reference to the naphthalene question, the President said that, in order to guard against naphthalene troubles at Long Eaton, the gas is washed in a primary Livesey washer, water-gas tar is used in a second washer, and paraffin is vaporized at the governor outlet. But it is not definitely stated whether this is successful; the words "to guard "against naphthalene troubles" suggest that it is. It would be interesting if Mr. Stevenson would confirm the success, in view of these passages in the brochure on "Naphthalene "Stoppages" issued by the Institution: "When paraffin "oil is employed, certain altered conditions are necessary "in its addition to the gas, on account of its having a much "higher boiling-point than the coal-tar naphthas. The "amount of this oil which can be taken up as a true vapour "is so low that the amount of such vapour present is in-"sufficient to prevent naphthalene deposition. It is, in "consequence, necessary to introduce the added amount of "this solvent to the gas in the form of a mist or fog, in such "a fine state of division that the mist particles are carried "mechanically with the gas to the extremes of the district "of supply." Mr. Whitehead, of the Ministry of Munitions, also finds that with paraffin the best effects are obtained by spraying. It will be noted that Mr. Stevenson vaporizes the paraffin. So, too, does Mr. Fletcher W. Stevenson at Coventry, with results detailed in the paper by Mr. George B. Jones, read at last Thursday's meeting of the Midland Junior Association.

Fit conclusion can be given to these miscellaneous points in the address, by remarking that good management works steadily towards a definite scheme for the manufacture and disposal of residuals with a minimum of labour, and that congratulation should fall thickly upon a manager who of late years has been able to obtain an average net return of about 90 p.ct. of the cost of his coal. We heartily congratulate Mr. Stevenson.

The Finance of the Outside Producer.

THE paper Mr. W. Chaney, the Engineer of the Saltley (Birmingham) Gas-Works, read at the meeting of the Midland Association last week, on the utilization of coke dust in outside producers for heating coke-ovens, may be taken as a supplement to the paper that he contributed to the proceedings of the Institution of Gas Engineers in 1913. But though an excellent case is made out for outside producers on current market prices for coal slack (with a proportion of nuts), supplying them with coke dust at 1s. per ton, and placing sulphate of ammonia to their credit at £16 per ton, it is clear that the producers have not altogether come up to expectations, and that, if other conditions supervene which are not so kindly disposed as the present ones, the balance-sheet will not be so presentable, though it may still be shown to be profitable.

In the first place it is doubtful whether outside producers, in view of capital expenditure, labour, and extra supervision, could be applied to any but the largest works. A very material part of their economy, too, depends on whether a works is making coke dust or a sufficiency of coke dust for the purpose of the producers. If not, a considerable difference would at once be apparent in the financial gain that is shown in the paper. When Mr. Chaney read his paper before the Institution in 1913, he stated, in replying to the discussion, that it was with the idea of utilizing coke dust and the small breeze that the outside producers were adopted, and it was found that, by utilizing the dust, the recovery was sufficient to cover the whole of the outlay entailed. Subsequent experience shows that it is not possible to work entirely with coke dust; but that coal slack, containing a proportion of nuts, has to be purchased to the extent of 60 p.ct., and that up to 40 p.ct. of coke dust can be mixed with it, giving a gas of 130 B.Th.U., and recovery per ton of the mixture of fuel of 69 lbs. of sulphate of ammonia. Mr. Chaney charges the producers with coal at 17s. 6d. per ton and the coke dust at 1s.—making the cost of the mixture 10s. 11d. per ton. He deducts from this 9s. 10d. for the 69 lbs. of sulphate of ammonia at £16 per ton, which, he says, reduces the net cost of the producer fuel to 1s. 1d. per ton. The 12 p.ct. expenditure of fuel for internally heated settings is by the outside producers increased to 24 p.ct.; and so Mr. Chaney submits that 2 tons of the mixture of fuel costing 2s. 2d. would set at liberty 1 ton of coke at 24s.

This financial relationship, however, depends largely on two factors—the value of sulphate of ammonia and the value of coke. And the relationship under even present circumstances is not that which Mr. Chaney presents. He has reckoned out the sulphate of ammonia at £16 per ton; while the £16 should be less manufacturing expenses, as well as (under the present controlled arrangement) the cost of conveyance to the purchaser and the provision of bags, which is a totally different thing, and which will reduce considerably the 9s. 10d. for the ammonia recovered per ton of the mixed fuel. The difference between 2s. 2d. and the value of 24s. put upon the coke set at liberty has therefore to be rectified by the deduction omissions—manufacture, conveyance, and bags—from the sulphate of ammonia receipts. Then, in addition, Mr. Chaney does not give the details or total of the gas-manufacturing costs with the producers; but he admits that they are "considerably higher" than the ordinary method of retort heating. Therefore the difference between the 2s. 2d. and the 24s. referred to above has a further inroad made upon it. Looking at the remainder (whatever it may be) suggests that there will be a good deal of speculation about the future financial outcome of outside producers in comparison with internal heating, without taking into account heat losses. When after the war fertilizers from all sources are let loose upon the world's markets, the sulphate of ammonia produced by the carbonization of coal will probably find a far different level from now in market value; and (reflecting on pre-war experiences) when coal supplies again become plentiful and cheaper, there may not be the same desire to release additional coke for the market.

Short as the paper is, it contains several very interesting features; but head and front comes this one of financial result. And on this point, the author does not carry us far enough, either in detail or total.

Industrial Gas Heating at Technical Meetings.

IT may be said without fear of contradiction that one of the most remarkable features in the latter-year development of metallurgical work has been the application of gas-heated furnaces, with substantial net balance of economy. When Mr. H. M. Thornton read his paper on the subject at the meeting of the British Commercial Gas Association in 1913, his hearers and readers were led to peer into the future and saw great all-the-year-round potentialities in industrial heating. But the most sanguine of them never allowed their thoughts or imaginations to compass the lightning development that has been effected in gas-furnaces themselves and in their adoption, in consequence of both their own good performance, and their quick application and responsiveness to the vast production which the exigent demands of the war forced upon our industries. Manufacturers of gas-furnaces will probably never publicly receive the full credit to which they are entitled for their part in this matter. However, they have the knowledge of good work done and the profit; and now the rapid success has to be utilized as a base for more achievements by gas in the country's work. Every opportunity must be taken wherever metal workers assemble to put forward the merits of the gas-furnace; and there are good and capable representatives of the gas industry ever ready to show working actualities and experiences which carry effect. Last week gas-furnace work was prominent on the platforms of technical organizations. It had large witness at the meeting of the Institute of Metals; and it was the foremost subject in the paper on "Gas-Works Practice under War Conditions" that Mr. G. B. Jones, of Coventry, read to the Midland Junior Gas Association on Thursday. As a matter of fact, while the tale of Coventry's experiences with gas in industrial heating was being related at Birmingham, the tale of a widespread experience was being unfolded at Burlington House, in London, by Mr. W. J. Hocking, telling how gas is used in the making of our coinage at the Royal Mint, by Mr. C. M. Walter, B.Sc., speaking of the use of high-pressure gas in metal melting, by Mr. H. M. Thornton and Mr. Harold Hartley, M.Sc., discoursing on furnace firing with gas, with special reference to the melting of brass and copper, and by Prof. George Bernard Brook, the Lecturer in Non-Ferrous Metallurgy in the University of Sheffield, who dealt with the same subject. There was among other communications one by Dr. H. C. Greenwood and Dr. R. S. Hutton, of Sheffield, on an electric resistance furnace for melting in crucibles; but this detailed work of a more or less experimental character.

When such figures as Mr. Jones laid before the Midland Juniors can be quoted, no further evidence is required that the merits claimed for gas-furnace work are substantiated by practice. Since 1914, the output of gas in Coventry has increased by 35 p.ct.; and at present about 60 p.ct. of the total output is consumed for industrial purposes. This is a very remarkable showing; and it demonstrates the greatest satisfaction on the part of manufacturers, and very definite economic superiority over the deposed system of heating. Coke heating for the purposes to which gas-furnaces can be applied is doomed to supersession. This cannot be avoided, as manufacturers cannot possibly afford to continue a system in which heat and metal losses, labour, and other expenses are greater than with the gas-furnace; and that they are so is attested by practically every paper read on the subject before the Institute of Metals, as well as by the figures already cited from Mr. Jones's paper. It may be that in some operations gas costs more than gas coke—that is, taking the bare fuel charge. But this is not universally so; for the heat losses by way of products of combustion, and owing to the longer time absorbed in doing a given amount of work, is greater with coke-fired furnaces than gas-heated ones. Besides fuel costs with gas diminish with successive melts, and more melts can with gas be got into the working day than with coke. But fuel is only one factor. Loss of heat, loss of metal, loss through bad castings, and loss through equipment (such as crucibles), as well as the cost of labour and plant and the amount and quality of output,

are others. Messrs. Thornton and Hartley, Mr. Walter, and other authors at the Institute of Metals meeting showed that the thermal efficiency of the gas-furnace stands well among the competitors, and that (excluding fuel costs, which vary with the price of gas and the metal to be melted) the economies are spread over all the other factors. To realize some of these factors, it might pay to partially sacrifice one or more of the others. But with the gas-furnace there is no need to do this, for the factors contributing to economy appear to have an interdependence, and the combination of resulting benefit has proved a strong commendation, and has produced the rapid progress in favour to which reference has already been made. A wealth of supporting information as to costs appears in the papers, which cannot be particularized here, though a part is given elsewhere in our report of the proceedings. In considering the figures, it must be borne in mind that costs per hundredweight or per pound of metal melted do not take into account the collateral advantages of gas heating, the value of which it is, of course, difficult to assess, though it makes a good impression on the ultimate costs in relation to output.

Such a bountiful success as gas has achieved in industrial heating is sure to attract competitors; and just as gas has found out and emphasized the defects and disadvantages of coke heating, so those who are introducing the electric furnace to the steel industry, and are attempting to adapt it to other metallurgical work, are pointing to places where, in their opinion, electrical operation rises superior to that of gas. For example, it is submitted that, in certain work, such as melting nickel silver, while the metal is affected less by sulphur when gas is used than when working with coke, the damage is entirely eliminated when electricity is employed. It is also claimed that the quality of the metal is improved, and that the crucible life is enhanced. These are claims that have to be demonstrated, though we are quite prepared to admit that there is some work to be done by the manufacturers in improving the longevity of pots heated by the gas method. However, the fact remains that the gas-furnace has made tremendous headway, and grows daily in favour for heavy and light work, and all that is intermediary. But there are other considerations. There are both capital and maintenance costs. About these nothing definite is allowed to transpire regarding the electric furnace. In his paper, Mr. Walter states that, for high-pressure gas operation, the cost of a 60 lb. pot furnace, inclusive of excavation and pitwork and connections to existing flues, amounts to approximately £25; while for a similar furnace of a capacity of 160 lbs. the cost would be about £35. The maintenance costs of the 60 lb. furnace, melting eight heats of brass a day, average 1·65d. per cwt. of metal melted; in the case of a 130 lb. brass-melting furnace (melting ten heats a day), the maintenance costs per cwt. equal 0·7d. We should like to know how the electric-furnace compares with these figures. In the paper by Drs. Greenwood and Hutton, it is shown that the average energy consumption with the electric-furnace melting nickel silver is per cwt. 42·5 kilowatt hours, which, at a cost of 0·8d. per unit, will amount to 34d. The cost per unit is benevolent; the cost per hundredweight is high. We have not the comparative figures for the same metal using gas; but the authors can judge, from figures given in the papers for other metals, that in the cost quoted they present a disadvantage which metallurgists will weigh in conjunction with capital, maintenance, and other considerations. The same authors state that the electric-furnace melting nickel silver scrap shows an efficiency of 22 p.ct. compared with 6 p.ct. with the gas-furnace. Of course, efficiencies vary with different metals and temperatures; and in their paper Messrs. Thornton and Hartley speak of efficiences of 17·1 and 21·3 p.ct. with other metals. We think that Drs. Greenwood and Hutton have made a slip to the disadvantage of gas. But whether they have or not, while the electric furnace is lifting its head and obtaining favour in certain steel processes, the gas furnace has a large field in which costs and much else of which it can boast will continue the real dominating factors.

Three-Month Gas Coal Contracts.

It is our satisfaction to make an announcement on our first editorial page which will go far to allay the suspense of gas administrators and managers regarding the recent notice of the Coal Controller as to the making of three-month instead of twelve-month contracts. It will be seen that the National Gas Council have lost no time in moving in the matter, and that Mr. D. Milne Watson, the Chairman of the Executive Committee, has been kindly given an opportunity by Mr. Guy Calthrop to explain to him the position as it affects gas undertakings. It is understood the Controller will shortly be writing to the Council on the subject; but the most significant statements in the announcement on an earlier page are that "the present difficulty will be satisfactorily overcome," and that "any contractor declining to make contracts *as usual* will be dealt with by the Controller." This has only one meaning—that gas-coal contracting can be proceeded with "as usual." The matter of the Controller's notice was discussed in the first editorial in the "JOURNAL" last week; and it was then pointed out that the exceptional position of gas undertakings, as being heavy coal consumers in winter and with good storing capacity in the light months of summer, which helped to relieve winter traffic, was well known to the Controller, who was giving consideration to the position. His request it appears came rather late for some gas coal contracting parties; for before its circulation there had been a considerable disposition to renew contracts for twelve months at last year's prices, and contracts for conveyance for the same period had also been entered into. This being so, and on general grounds, the Coal Controller's intimation caused considerable anxiety in the industry, which, however, as seen, need not continue. The industry will await with interest the Controller's letter to the National Gas Council.

The Revision of the Sliding-Scale.

In our "Correspondence" columns, Mr. Arthur Valon, Mr. F. A. Gulland, and Mr. T. H. Duxbury carry on the argument for the revision of the sliding-scale. They make some excellent points. In their view, Mr. A. M. Paddon's proposal for the preservation of at least the standard dividend [*ante*, pp. 551, 565] does not go far enough to do even justice; but we should not be prepared to support—and we do not think there is any intention to go this length—a suggestion of revision that aimed at placing in all cases the whole burden of current adversity on the consumer without any sacrifice whatever on the part of the proprietor. At the same time, when it is considered that there are companies with a 3½ p.ct. standard dividend for a large part of their capital, the position is one in which, with the heavy income-tax, the preservation of the standard dividend alone would not be a fair thing. The arguments of our correspondents show why they think Mr. Paddon's suggestion does not go far enough to fit all cases; and, in doing this, they unknowingly answer a private correspondent, who urges that the terms on which the sliding-scale was granted should not be assailed, inasmuch as the industry would be exposing itself to a charge of selfishness. Looking round at other trading enterprises, we fail to see anything selfish in dissatisfaction at dividends that have fallen away to round about 4 p.ct., less heavy income-tax, and some (and important ones) are going lower than that.

The Position of the Gas Proprietor.

The main factor in the sliding-scale system is the standard price; and we undertake to say that very few gas proprietors (we know a good many) ever gave much thought to it when making investment, but bought, as Mr. Valon and Mr. Gulland say, their stock on the return at the time obtainable on the investment, and which return past experience gave them good grounds for hoping would be maintained. Proprietors have also paid premiums for new issues of gas stock upon which they get no dividend whatever. What did they pay the premium for? Was it to be brought face to face with such a grave situation in respect of dividends as now in some companies confronts them, while in other directions a higher and definitely maintainable return is being paid for money? And they have the mortification of knowing that the upheaval for the gas industry has been such, that for years it is not likely the old conditions in regard to materials, labour, and capital will be even approximately retrieved, and that the dividend for which they paid a price is not likely to be restored for many a long day. It is not those who are advocating a revision of the sliding-scale who are attempting to undermine its basic conditions, but current circumstances that have already done so. To argue otherwise would be but trifling with facts. All the factors taken into consideration by Parliamentary Committees in determining standard prices (if in some cases considered at all, which is doubtful when one remembers the haggling there has

been over them in committee rooms) have been completely shattered by the war; and there are in consequence gas stock and share holders who are severely suffering loss now as no other stock or share holders in substantial enterprises are doing. Prices of materials and labour have gone up for these other enterprises; income-tax is the same for them as for the gas industry; but they are in a better dividend-paying position than numerous gas companies. The gas industry is doing a substantial business in its primary and secondary products. But it is the only industry of its position of which we know in which the proprietors are so hardly hit under the current abnormal conditions. Why is it? The only answer is that the sliding-scale was made for normal weather; it was never intended for the inclemency that at present prevails.

Wages and Taxation after the War.

These are subjects that have a bearing on the question of the position of proprietors in sliding-scale gas companies after the war. It is certain capital and materials will be dearer than before, and will assist to keep the level of gas prices higher and dividends lower than they would otherwise be, unless in the latter respect something is done to assist in alleviating the effects of the conditions. The cost of labour and taxation will also be higher. Sir Albert Stanley, President of the Board of Trade, addressing the Association of Chambers of Commerce last Tuesday, said that business men have to face the fact that higher wages have come to stay; and so long as an honest day's work is given, it seemed to him that it is an advantage to the country that these higher wages should be continued after the war. Mr. George Stevenson, from the presidential chair of the Midland Association of Gas Engineers and Managers last Thursday, also said it is certain that higher wages will have to be paid to all workers whether by brain or hand. Higher wages will apply generally; and just as in the gas industry the extra charge will fall upon the price of gas, so in other industries it will fall upon materials and manufactures, some of which, to the extent of millions of pounds a year, the gas industry has to buy. All this will tend to maintain the prices for gas at higher levels. In place of increased wages in the gas industry after the war—increased as compared with pre-war payments—co-partnership ought to find a grand opportunity. As to taxation, Sir Albert Stanley says that following upon the war the country will be left with enormous charges; and taxation will no doubt be upon a scale very few of us have realized. The hardship to the industries will be very serious. Here, again, the extra taxation must fall upon the consumer; but the sliding-scale governed part of the gas industry will be in a position different from all other industries, in that so long as the new conditions—uncontemplated in framing the sliding-scale—obtain, so long will dividends be on a lower scale.

A Good Grant for Scientific Research.

On another page, review is made of an article by Professor John W. Cobb on the "Scientific Aspects of Fuel Economy." He indicates the large scope here presented for research, and he alludes to the necessity for liberal financial support by the Government. In this connection, it is interesting to note that the Government estimates for 1917-18 in respect of education, science, and art, amount to £21,412,175—a net increase on the sum voted for 1916-17 of £764,787. The rise is accounted for almost entirely by a new grant of £1,000,000 in aid of scientific and industrial research. This sum will be paid to the account of the Imperial Trust for the encouragement of scientific and industrial research, and grants will over an agreed period be made to approved trade associations by the direction of the Privy Council Committee. Provision is also made for the distribution by the same Committee, on the recommendation of the Advisory Council on scientific and industrial research, of grants totalling £24,000 in aid of investigations carried out by learned and scientific societies, and £6000 to students and others engaged in research. The Government is certainly waking up to view from the practical side a pressing necessity of the country, if it is to make the strides essential to keeping pace with its most active competitors in the industries and commerce of the world.

Amendments have been made to the Defence of the Realm Regulations regarding the taking over of mines by the Government, so as to provide, where thought expedient by the Minister of Munitions, for the taking over of fire-clay and other mines.

PERSONAL.

Mr. JAMES BARBOUR, Assistant Manager of the Saltcoats Gas-Works, has been appointed Manager, to succeed the late Mr. J. NAPIER MYERS.

Mr. JAMES DICKSON, Assistant Gas Manager at Kirkintilloch, has been appointed Manager there, in place of Mr. JAMES BELL, who is now Manager at Dumbarton.

At their meeting last Wednesday, the Directors of the Sunderland Gas Company elected as their Chairman Alderman W. F. VINT, the Mayor of the town, in succession to the late Mayor, Alderman S. Richardson.

Mr. WILLIAM M. JESTY, who has for some time acted as Assistant Secretary of the Bexhill Water and Gas Company, has now been appointed Secretary, in succession to the late Mr. R. D. JESTY, who had been Secretary to the Company since its incorporation.

Mr. HAROLD HIGHAM, who has recently been Acting Manager of the Shipley Urban District Council's gas undertaking (having been lent in an emergency by the Bradford Corporation Gas Department), has now been appointed Gas Manager at Shipley, at a commencing salary of £250 per annum. Mr. Higham is one of the leading members of the Yorkshire Junior Gas Association. Certain very urgent repairs are required at the works, and others are deferred to the end of the war.

Mr. GEORGE B. JONES (who read a paper at last Thursday's meeting of the Midland Junior Gas Association) will be leaving Coventry at the end of this month to take up an appointment as Chief Chemical Engineer with British Dyes, Ltd., and will be Dr. Davidson's chief assistant. Mr. Jones was trained under Messrs. Chance and Hunt, Ltd., and with the Chester Gas Company as engineering pupil. He has been employed at Coventry, with Mr. Fletcher W. Stevenson, M.Inst.C.E., for the past six years—first as chemist, later as chemical works' manager, and for the past two years as Assistant Manager of the Gas Department.

A presentation to Second-Lieut. H. D. LEES from the combined staffs of the Hendon and Ayres Quay Works of the Sunderland Gas Company was made last week, at the offices of the former works. Lieutenant Lees was awarded the Military Cross on Jan. 10, and is at present at home on sick leave. Previous to taking up his military duties in May, 1915, he had been engaged as a chemist in the laboratory at the Hendon Gas-Works. The presentation took the form of a silver cigarette case, suitably inscribed, and was made by the Engineer (Mr. C. Dru Drury), who stated that the gift was intended as an indication of the pleasure and pride with which the staff regarded the distinction gained by one of their number. Lieutenant Lees, who is 19 years of age, was awarded the Military Cross for his work at Beaumont Hamel. He went into an attack with his company when the officer commanding was killed, another was wounded, and Lieutenant Lees was left to carry on. They gained their objective, and came back with a batch of prisoners and two machine-guns.

OBITUARY.

The death took place last week of Mr. WILLIAM CHARLES BUCKLEY, at Longsight, Manchester, in his 86th year. He was a Director of the Fleetwood, Leyland, Whitworth Vale (Rochdale), Rossendale Union (Haslingden), and Westhoughton Gas Companies, all of whom were represented at the funeral, which took place at Birch, near Heywood.

Gas men throughout the country have lost an old friend through the death of Mr. THOMAS E. PRIESTMAN, which, we are sorry to state, occurred about noon on Friday, after some months of failing health. Mr. Priestman had been with Messrs. R. & J. Dempster, Ltd., ever since the firm started in Manchester in the early eighties; and by them he will be greatly missed. Outside his connection with the firm, he was Vice-Chairman of the Felixstowe Gas Company and a Past Master of the Evening Star Masonic Lodge. The remains are to be cremated at Golders Green at midday to-day (Tuesday).

Mr. and Mrs. R. A. Browning, of Neath, have received intimation from the War Office that, as they have failed to trace their son, Major R. G. S. BROWNING, since he was officially reported missing on Oct. 2, 1915, they regret it must now be presumed he was killed in action on that date. Major Browning was Adjutant in the Welsh Regiment, serving under Lord Ninian Stuart, who held him in high appreciation. The Welsh were violently attacked by superior forces of the enemy, and retired a short distance to a stronger position, on reaching which it was discovered that Major Browning was missing. Immediately upon learning this, Lord Ninian Stuart organized and led a rescue party; but he lost his life in the attempt to save his friend. Major Browning was declared to be a splendid soldier, of fine physique, brave to a fault, and very popular among officers and men.

We have received intimation of the fact that Second Lieut. CYRIL DOUGLAS M'COURT, who shortly after the outbreak of war abandoned research work to join the army, was killed while gallantly leading, as bombing officer, an attack in France on the

night of Oct. 8 last. He was born in 1883, and gained an Institute Scholarship at the City and Guilds of London Central Technical College, now the Imperial College of Science and Technology. In 1903, he was appointed Chief Chemist to the Morgan Crucible Company, Ltd., which post he resigned six years later in order to collaborate with Prof. W. A. Bone, F.R.S. (then of the University of Leeds), on the industrial applications of the principle of incandescent surface combustion, which collaboration speedily resulted in the many important inventions comprised under the "Bonecourt" system of surface combustion. In pursuance of this work, Mr. M'Court became successively Managing-Director of Radiant Heating, Ltd., and Chemist and Technical Adviser of the Bonecourt Surface Combustion Company, Ltd., and later on also of the Commercial Laboratories, Ltd. He was subsequently appointed Consulting Chemist to the Morgan Crucible Company, Ltd., which position he held up to the date of his death.

SCIENTIFIC ASPECTS OF FUEL ECONOMY.

Prof. Cobb on the Problems Awaiting Consideration.

The appointment of a Board of Fuel Research by the Committee of the Privy Council for Scientific and Industrial Research has induced Prof. John W. Cobb, Livesey Professor at the Leeds University, to contribute an article to "Nature" (extending to some five columns) on the real and pressing need for securing, so far as it may be done by official efforts, the fuller investigation of the potentialities of fuel. He speaks of the depressing spectacle that the maltreating of our supplies of irreplaceable coal has been to those who make a study of its scientific utilization. Recognition of the value of purely thermal economies has been fairly general, although the quantities of fuel used in feeding small steam-engines permit no unqualified statement to that effect; but the less instinctive appreciation of the chemical value latent in coal has been a slow, and is still a stunted, growth. Our recent needs for benzene, toluene, and phenol for the making of high explosives, and the publicity given to the coal-tar dye question, have opened many eyes to the value of carbonization, apart from its production of coke for blast-furnaces and gas for our towns; but even now the iniquity of the prevalent nitrogen waste passes almost unnoticed. To regard coal always as a source of available heat, tar, and nitrogen is a habit of mind to cultivate; consistent condemnation and eventual elimination of methods of use which offer violent offence to that regard will follow.

The particular directions which reform will take, or ought to take, in the many uses to which coal is put are less obvious than the urgent necessity for reform. Carbonization, with all its possible variation of methods and results, demands a closer systematic study on both the small and large scale, in laboratories suitably equipped and staffed and in the works. Comparison of the results obtained by Wheeler at home and by Pictet abroad with those of ordinary coke-oven or gas-works practice shows the extent to which the nature and quantity of products are dominated by variation in conditions of operation, and emphasizes the necessity for a thorough knowledge of the processes involved in the transition from primary to secondary products of carbonization, with a view to their intelligent control.

The work of Bergius, although (as Professor Cobb points out) of uncertain value on the industrial scale, touches upon another possibility—that of carbonizing under very high pressure. If successful, it would demand a new type of plant, somewhat analogous to that employed for the Haber synthetic ammonia process, and presenting new problems of construction and working. At the other end of the scale, stands carbonization with reduced pressure, already under trial on a scale above that of the laboratory. Less removed from current practice in carbonization are the low-temperature processes, such as the Del Monte, and the presumably improved form or development of the ill-fated Coalite process, which, it is hoped, will receive an adequate trial at Barugh. Several questions await answer from such processes. It is conceded that they can produce tar rich in low-boiling point constituents. But are these constituents to be mainly paraffinoid, as certainly seems probable, or aromatic, with benzene and toluene? The ammonia yield is in question; laboratory experiments indicate that a real beginning is not made in forming ammonia from coal by heating until a temperature of 500° C. is exceeded, and that 700° to 800° C. is necessary for a yield which the standard carbonizing practice would call good. Soft coke has undoubted advantages for the open grate, but can it be made for carrying in bulk without crushing? These are some of the simpler issues.

As regards nitrogen, the Mond process, with its 60 to 70 p.ct. recovery as ammonia, is satisfactory; but the gasification of coal in an air-steam blast gives of necessity a gas too highly diluted with nitrogen to be of any service for high-temperature operations, excepting in large furnaces where regeneration can be employed. The tar, too, has its peculiarities. Otherwise the process is successful in practice, as it is sound in principle; and all concerned with its initiation are to be doubly congratulated—in the first place, on an extremely valuable contribution to the science and practice of fuel utilization, and, in the second, on the comparatively advanced stage to which the working-out of the process had been carried before it was declared ready for use.

None of our methods of using fuel can be regarded as attaining the ideal, but the most disturbing factor in the situation is that such advances as we have made are not properly utilized. However, in Prof. Cobb's opinion, "the country was never so ready as now to accept the application of a remedy for these evils, but must first feel that before it lies a rational treatment, based on a sane and sober diagnosis, and not on the facile verbalism of ill-considered propaganda." Some few simple prohibitions, the professor thinks, automatically progressive in their application, may be found advisable, and, if so reasonable as to be practicable, would probably be effective in checking criminal waste, and at the same time encourage those developments in the technique of fuel utilization on which we must depend ultimately for success.

There has been wanting sufficient systematic attention to fuel problems from investigators, administrators, and legislators alike. It is true that, owing largely to the initiative and foresight of Prof. Smithells, the University of Leeds (followed more recently by the Imperial College of Science and Technology) has established a department of fuel technology, and that the gas industry has generously endowed there the Livesey Chair in memory of a great leader. But how long has the paramount necessity for what were pioneering ventures a few years ago been recognized, and how very much more remains to be done before it can be claimed that the subject of the scientific utilization of fuel is receiving anything like adequate study or the same degree of public support as is accorded in America and Germany. Committees are to the fore just now; and Prof. Cobb refers to the one appointed by the British Association, with Prof. Bone as Chairman, for the investigation of fuel economy, the utilization of coal, and smoke prevention. The work of this Committee has been absorbed by the Board of Fuel Research; but the article surveys the first report of the Committee, which was noticed in the "Journal" in September last. Reference is also made to a report issued to the Executive Committee of the Manchester Steam-Users' Association by Mr. C. E. Stromeyer, their Chief Engineer. In this, it is pointed out that on the Continent first-class coal cannot be obtained; "but there the works provide themselves with ample boiler power, and, on the whole, they obtain a higher efficiency than we can hope for with our superior coal but hard-worked boilers." To use coke, and conserve the bye-products, Mr. Stromeyer says, would necessitate the same reform. "Steam users naturally do not like coke, partly on account of the relatively high price, and partly because it would require larger boilers than the present ones in which to burn it with as good effect as the best coal." Mr. Stromeyer should obtain information from the London Coke Sales Committee as to the strides that coke for steam-raising has been making in London and the suburbs.

In the article, Prof. Cobb does not attempt to do more than stand at the gate of the large and imperfectly explored territory that fuel application presents. But, although in all probability no such effective blight could be laid upon the work of scientific investigation in any field as that of undue centralization and impossible regimenting, enough has perhaps been said to indicate that the scale of research necessary for adequacy in the domain of fuel necessitates, among other things, liberal financial support, and, if the Government is going to provide this support, it will naturally seek for guidance. Presumably the new Board of Fuel Research is to guide. This form of organization for research is new to the country, and its working will be watched with great interest. There are pitfalls in the way, which it may be difficult to avoid, and would certainly be folly to ignore; but an administration directed with liberality of spirit to really national ends will go a long way to command success.

Coke-Oven Managers' Association.—The fifth meeting of the Midland Section of the Coke-Oven Managers' Association will take place at Leeds University next Saturday. A paper will be read by Prof. J. W. Cobb, B.Sc., F.I.C., on the "Utilization of Low-Grade Fuels."

Informal Meeting of Scottish Gas Managers.—The thirty-fourth Annual Informal Meeting of Scottish Gas Managers will be held in the Royal Technical College, George Street, Glasgow, on Wednesday of next week, at 2 p.m. Mr. Charles Fairweather, of Kilmarnock (the President), will deliver an address. On this occasion, there will be no dinner. The Convener (Mr. J. W. Napier, of Alloa) intimates that it is intended to make a collection at the meeting on behalf of the Princess Louise Scottish Hospital for Limbless Soldiers and Sailors. Mr. Napier will be pleased to receive contributions from any unable to be at the meeting.

Detention of Railway Wagons.—To secure the utmost possible use being made of the available supply of railway wagons, the Board of Trade have issued orders, which come into force at the beginning of April, fixing the times beyond which the retention of a railway wagon will be an offence under the Defence of the Realm Regulations. The times allowed are, in general, one complete day for loading and two for unloading. Three days (four in Scotland) are permitted for unloading shipment traffic at ports, and two days are allowed in Scotland for loading wagons with coal for shipment. The Orders do not apply to coal traffic in England and Wales, but to other goods. Further Orders give power to railway companies themselves to unload wagons which are not unloaded by the trader within the prescribed times, and to make use of private owners' wagons on the return journey, so that the unnecessary haulage of empty wagons may be avoided. These Orders are being printed as statutory rules. Where necessary, the periods at present allowed before demurrage charges accrue will be amended to accord with those fixed by these Orders.

ELECTRICITY SUPPLY MEMORANDA.

The electricity supply industry is growing enthusiastic again. It is full of hope and anticipation regarding the possibility of supplying cheaper electricity, upon which so much depends. This for many years to come cannot be done through low-priced capital, coal, structural materials, and labour; but the men of the industry are conjuring up cheapness from linking-up undertakings, and constructing (when the problem of wayleaves has been solved) an expensive network of cables over the country and throughout the agricultural areas, for the purposes of intensive cultivation. The villagers will tap the mains for lighting and other purposes; the parish councils will light the streets with the current; the farmer will stretch wires over his land, and the energy from them will cause luxuriant crops underground and overground. The vision is a glorious one; its accomplishment is not yet. The recent linking-up conference at Manchester with Mr. G. H. Roberts, M.P., Parliamentary Secretary to the Board of Trade, is in some quarters looked upon as being of good augury; while in others it has forced hopes into the background. The Lancashire and Cheshire local authorities were represented in force; and there was unanimity on the part of the speakers that linking-up is a proper scheme to pursue. What those who did not speak thought has not as yet transpired. Mr. S. L. Pearce, the Electrical Engineer of the Manchester Corporation, was the chief spokesman, and told Mr. Roberts what that gentleman probably already well knew, that the interlinking schemes which had been drawn up for Lancashire and Cheshire, involving an expenditure of £281,000 on interconnection mains and transformer plants would, according to the estimates, taking coal at 17s. 6d. per ton, realize an annual saving on fuel alone of £82,000 per annum, simply and solely from the more efficient use of plant. Labour and capital costs would also benefit, and this through making greater use of the best there is in the existing stations, shutting-down the less economical plants at week-ends and at times of light load, and the stations helping one another to tide over the peak loads where these do not absolutely synchronize.

The Road to Cheaper Electricity.

The scheme is a beautiful one. The saving in coal expenditure alone would make it—if it works out according to the paper estimates better than the German Berlin to Paris and Calais time-table—a fine investment for the electrical industry in Lancashire and Cheshire, without taking into account the minor savings on capital and labour. But as intimated last week, those who are enthusiastic for this development have had their spirits somewhat damped by the statement of Mr. Roberts that it must all be deferred. The schemes have the blessing of the Board of Trade. The Board recognize the potentialities of it; they are convinced that cheap electric power means much to the development of the national industries. But we are at war. There is extreme difficulty in raising capital; and the Ministry of Munitions are exercising a very tight control over every ounce of metal, in view of the enormous requirements for the war. Perhaps it is as well it so happens. Such a scheme ought not to be rushed through as an independent thing. It should be regarded as an item only in the great efforts at producing general national economy; and it should come in as part of the work of the Board of Fuel Research, with consideration of the question as to whether or not, through the gas-works of the country or by independent means, fuel economy cannot be better served by the employment of fuel from which, by the carbonization of coal, valuable products have been first recovered. Get the places of fuel consumption—generating stations, which are (so to speak) the roots of electricity supply—first on a proper fuel-economizing basis, and then there could be a branching-out in the manner contemplated by the linking-up schemes. The shortest cut to an object may only achieve partial success, and that is what linking-up would do. And it seems to us that reform in this matter should start at the base. Perhaps we are wrong; but there is nothing wrong in suggesting that intercommunication should be part and parcel of the larger national inquiry into fuel economy—more especially as nothing can be immediately done in the matter of linking-up. One speaker at the Manchester conference referred to the necessity of municipal frontiers being broken through in promoting the national interests in connection with such a service as electricity supply. Just the same the old industrial frontiers must be broken through if the national interests demand.

Interlinking and Fuel Economy.

This is a wonderful country. The war has shown its capacity for doing many remarkable things, some of which have proved very uncomfortable for the retreating Germans on the Western Front, who have been busily adding to the testimonials to their moral degeneration by wrecking and burning the homes of the civilian population, destroying their crops and fruit trees, and, most dastardly of all, poisoning their wells—these the doings of a once proud military people! This country is now bidden to make itself self-supporting in the matter of food; and, responding, it is already at work. The electrical industry wants to do its bit—at what price is not yet known. But the gas industry may take heart; it is not at the expense of artificial fertilizers. The electricity would be used when there is no sunshine—on dull days and during the night. "The explanation is simple—the electricity splits up the ions of the atmosphere, and enables plant growth to extract the nitrogen. The more manure you put on the soil the better your electric results will be. If you treat the ground well, the crop will increase a hundredfold." That is good. Sulphate of ammonia is not to be dethroned; it is to be an ally of electricity. The quoted words are from the report of an interview which an "Express" representative has had with Mr. W. T. Kerr, the Electric Engineer of Hereford. He has been taking great interest in this question of electro-culture, and read a paper on the subject last June before the Incorporated Municipal Electrical Association. The Board of Agriculture are now instituting experiments; and Mr. Kerr is the engineer working in conjunction with Professor W. H. Blackman and Mr. Ingvar Jorgensen. By electricity, Mr. Kerr says, command is obtained of atmospheric conditions conducive to the growth of vegetables, cereals, fruits, flowers, and all growing things, and the doubling or trebling of their annual yields. Mr. Kerr has an electric plant fitted over half an acre of ground, and farmers have been there to have their eyes opened with astonishment by potatoes with stems 8 ft. high and the potatoes themselves as large as swedes—one 1 ft. long and 8 in. across. There is the authority of the "Express" representative that this is not all fiction; but he does not allocate the credit between the manuring of the soil and the ion-splitting electricity:

Electro-Culture.

> Mr. Kerr showed me the electricity in action. I was told to listen in the garden while he switched the electricity on. The wires were not quite taut, and swayed in the wind. Presently I heard a sound like the approach of an army of grasshoppers. As the wind rose the sound resembled the fizzling of bacon or the crackling of thorns. Strangest of all, plants and bushes could be seen moving upwards and reaching towards the vivifying wires. Plant life was no mere figure of speech. "It is just the same with wheat, barley, oats, clover, fruit trees, and flowers," said Mr. Kerr. "They rise to greet the electrical elixir. Long green caterpillars that work havoc on fruit trees drop electrocuted."

In a conservatory Mr. Kerr showed the effect of electro-culture on seed which had been sown in boxes of soil five days before. Already there was a rich blade an inch above the soil. Oats, potatoes, and clover yield the most flattering results. The men of the gas industry are interested in this from three points of view. They are only human, and they do not want to suffer unnecessarily from shortage of food production and of the means of transport, though they fear that during the war the electrical contribution to intensive cultivation is not going to do so much as their own sulphate of ammonia production, the export of which is now stopped, and the demand for which down south is absorbing the production of the gas-works. They are interested in it, too, from the standpoint that it is not unfriendly to their production of an artificial fertilizer. They are further interested in it from the point of view that the electrical industry is looking more and more to bulk production and diversity of use as, in generation, distribution, and management, economizing factors which contribute to a general reduction of price for all purposes. But more evidence is required than potato stems 8 ft. high and potatoes 1 ft. long and 8 in. across to prove practicability and other things. Cost of application and quality (as well as size) of produce are considerations. One other item of information bearing on this subject. It is reported that the Municipal Electrical Association have appointed as a Committee the Electrical Engineers of Chester, Norwich, Bristol, Brighton, Ipswich, Wolverhampton, and Hereford, to report as to the development of electricity in agriculture.

L.G.B. and Support for Litigation.

In allusions to the begging appeal by the Hackney Borough Council for contributions towards the expenses of defending the action which the Gas Light and Coke Company have instituted against them in connection with the question of preferential charges, the question has been asked as to what the Local Government Board would think of such contributions. Not as the result of our references, but for their own protection, two at least of the local authorities who were contemplating doing a little bit in helping the Hackney Council (who rather shy at bearing the whole of the probable costs) have sought a ruling from the Board as to the propriety of a contribution. To the Barnes District Council the Board have replied that they are not aware of any legal authority enabling the District Council to make such a contribution as that proposed, and that the Board do not think they could properly undertake to sanction expenditure of this kind, so as to withdraw it from the jurisdiction of the District Auditor at the audit. The Hackney Council have been informed of this decision; and they are no doubt sorry that their would-be friends took the precaution of obtaining it.

Gas and Electricity in Double Harness.

The electrical papers are getting a bit more respectful than was their wont once upon a time regarding the running of electricity enterprises by the proprietors of gas undertakings. It was said to be a bad alliance; it was impossible for men saturated with gas to give an electricity business a fair and impartial head; there was something altogether unnatural about it. Inspection of the situation failed to enable certain electricians to see that business men did not as a rule

embark on a goodly capital expenditure without doing their best to get from it a fair return. And they could not see that the established position of a gas undertaking, and the economies in the matters of supervision, staff, and fuel, had anything whatever to do with the correctness of the policy of the two supplies being under one domination. All economies mean lower prices than would otherwise be possible; and these lower prices invite and obtain greater patronage. There was a decided weakening of attitude on the part of the electrical opponents of dual running of gas and electricity concerns after Mr. J. W. Napier, of Alloa, read his paper before the North British Association last year, and showed some working results that made many a man brought up in the narrow electrical way rub his eyes to make sure that they had not been the channels of deception. Now the Chairman of the Aldershot Gas, Water, and District Lighting Company (Mr. W. T. Robertson, J.P.), told the shareholders the other day that their electricity undertaking was only completing its second year; and the result was marvellous. He added: "It was extraordinary to start a new business, and at the end of the second year to be able to place on record that it was now on a paying footing—paying its expenses after two years. He did not think there were very many electric supply companies in the country which could start their business *de novo*, and in two years record that it was paying its expenses." That is quite right; there are very few electrical supply undertakings of the size of the one attached to the Aldershot Gas Company's works, and in residential areas, that have ever shown financial success. There would be greater joy than there is in the electrical land to-day if the Aldershot experience was a universal one among electricity undertakings run independently of all family ties. These testimonials to the propriety of electricity concerns being conducted, where possible, under the protection of the gas industry are silencing the purblind critics.

Suspended Animation.

Electrical traction wants to give a certain weekly contemporary full assurance that it is not by any means immaculate, and that it can supply evidence of an ardent desire to set trains on fire, and to put the public to serious inconvenience by complete collapses. But two electric tramcars at Glasgow Cross last Saturday week resolved to vary these commonplace doings, and to create a little record of their own. They started by colliding; one of them was derailed; and it proceeded to knock down an iron electric section box. This caused the car to become electrically charged; and the unhappy passengers found their capacity for movement suddenly suspended. They had to be rescued from their uncomfortable position by rubber gloved officials. Four of the passengers were found to be suffering from shock, and one was detained in the infirmary. It will be many years ahead before these people refrain from telling the tale of how they were almost electrocuted at Glasgow Cross on a Saturday night in March, 1917.

METAL MELTING BY GAS.

A SERIES of four papers on various aspects of melting metals by gas was read on the second day of the annual meeting of the Institute of Metals on Thursday last. Sir GEORGE BEILBY, F.R.S., the President of the Institute, said the object of the discussion was to bring out all that was best in the latest methods of melting. The desiderata in metal melting were: First, speed; second, purity of the molten metal, which must be preserved from gaseous contaminations and at the same time to obtain control of the temperature; thirdly, economy in fuel; fourthly, economy of labour; fifth, economy of repairs. These were the most important points in dealing with metals generally, although no doubt special precautions would have to be taken in the case of certain metals. It was proposed that all the papers should be read and then discussed together.

METAL MELTING AT THE ROYAL MINT.

By W. J. HOCKING.

Owing to a steady increase in the demands upon the Mint in recent years for coinage, it became necessary to extend the capacity of the melting branch; and the furnaces were re-built and adapted for gas fuel in substitution for coke. First of all, however, a protracted series of experiments was made with various classes of fuels and burners; and the most satisfactory results as to speed of melting and economy of cost were obtained by the use of coal gas at low pressure. These experiments numbered over 250, and were made with nineteen different burners for oil and for gas; most of the burners being tried under various conditions of air and fuel pressures. Experience pointed to the desirability of securing a liberal supply of gas at a constant pressure; and a supply under these conditions was undertaken by the Commercial Gas Company. A 12-in. street main was laid to the meter-house, where four meters, each of 1000-light capacity, were installed, one to act as a reserve. From the meter-house, a 9-in. service-main supplies the melting-houses direct; and the consumption of gas in melting operations is readily ascertained.

After describing and fully illustrating the installation of gas-furnaces, Mr. Hocking proceeded to a comparison of costs of melting.

Records are kept in the department of the results of melting with gaseous fuel for comparison with similar results obtained with coke. These results are available for a period of five years ended March 31, 1916, in the case of gas, and for five years ended Dec. 31, 1909, in the case of coke. The periods named cover extensive operations. During the five years 1911-16, nearly 10,000 tons of metal were melted and cast into bars for coinage, with a total consumption of 121 million cubic feet of gas. A comparison of the records for the two periods shows an economy in favour of gaseous fuel under all the following heads: (1) Rate of output; (2) cost of fuel; (3) cost of graphite goods; and (4) cost of labour.

The respective costs of coke and gas are well known to vary considerably in different localities. They are also liable to vary in the same locality throughout a given period, though there is a fairly constant relation between the cost of one as compared with the cost of the other. During 1905-9, the price of best foundry coke delivered broken for use at the Mint fluctuated from 35s. as a minimum to 42s. 4d. per ton as a maximum; while during 1911-16 the discount price of gas per 1000 c.ft. varied only very slightly from 21d., except during nine months of 1915-16, when it was 18·2d. Although the price of gas advanced 12½ p.ct. during the last five years, the net cost to the Mint remained practically stationary, owing to the sliding-scale of discounts allowed by the Commercial Gas Company. On the total expenditure for fuel for the two periods of five years, a cash saving of 3½ p.ct. on the amount consumed per ton melted is shown for 1911-16. The amounts melted and the fuel consumed for the two periods are shown side by side:

	1905-9.	1911-16.
Gross amount of metal melted	4833 tons	9899 tons
Total consumption of fuel	2677 ,,	121 million c.ft.
Consumption of fuel per ton melted	11 cwt.	12,220 c.ft.
Cost of fuel per ton of metal melted	21·3s.	20·58s.

The above comparison is made on the basis of the gross amount melted. Owing to the general practice of melting two or more metals simultaneously, it was not possible to secure an extended series of records of the fuel consumption for one metal alone. None whatever are available for the coke period. The following rates of consumption for the various metals are approximately true for gas; but, being based upon readings for comparatively short runs, are subject to revision. The approximate specific gravities and temperatures of pouring are added in the table, as these are essential factors in the relative consumption of fuel.

Metal.	Approx. Specific Gravity.	Approx. Temperature of Pouring °C.	C. Ft. of Gas used per Ton Melted.	Cost in Shillings per Ton with Gas at 21d. per 1000 C.Ft.
Gold	17·3	1150	7,000	12·25
Silver	10·35	1090	12,000	21·0
Bronze	8·9	1165	14,500	25·375
Cupro-nickel	8·8	1300	22,000	38·5

The crucibles used for both the coke-fired and the gas-fired furnaces were of the Morgan Salamander brand; the mixture being modified in the latter case to suit the firing. A considerable extension of life was found when they were used with the gaseous fuel. The total inclusive costs for the two periods are placed side by side, and show that the rate per ton melted has been reduced by about one-third.

	1905-9. (Coke Fuel).	1911-16. (Gas Fuel).
Weight of metal melted	4833 tons	9899 tons
Total cost of crucibles, &c.	£9,625	£13,295
Cost of crucibles per ton melted	39·8s.	26·8s.
Rate of reduction in costs		32·6 p.ct.

In the latter period, the total amount includes advances in price due to the war, and also extra costs incurred in the earlier stages, before the manufacturers supplied crucibles specially suited for use with gaseous fuel. The mixture now employed gives excellent results. The improvement in the quality of the crucibles is reflected in the reduction in the rate of cost per ton melted. Comparing the years 1911-12 and 1915-16 (the first and last years of the gas period), the drop was from 37s. to 22·7s. per ton melted, and comparing the five years, 1905-9 (using coke), with last year, 1915-16 (using gas), the reduction was from 39·8s. to 22·7s., or about 40 p.ct.

As to labour, viewing the staff as a whole, the number of men required for a given out-turn of coinage bars was reduced by the change of practice at the rate of about 20 p.ct.

	1905-9.	1911-16.
Average annual melt	967 tons	1980 tons
Average number of men employed	16·2 men	27 men
Average number of men per 100 tons melted	1·68 ,,	1·36 ,,
Rate of reduction of labour		19 p.ct.

A comparison of the actual expenditure for the two calendar years 1909 and 1913 was made under three headings—viz., fuel, crucibles, and wages—the money value of which can be most readily ascertained. The result showed a saving in the latter year of 22·8s. per ton, or

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RETORT - OVENS
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27·6 p.ct. of the total cost in 1909. This economy, on the year's melt of 1958 tons, at the average rate of 22·8s. per ton, amounted to £2232. The chief item of cost occurring with gaseous fuel, but not with coke, arises in the provision of power for the pressure blowers. This item, however, is a comparatively small one.

The figures in the paper, the author pointed out, were compiled from the working accounts of the department; and no allowance was made for such delays and accidents as have occurred in the routine of work daring the periods under review. This feature should be borne in mind in comparing the results shown for the last five years with those of special test runs frequently quoted by furnace manufacturers. In point of fact, the weight of the metal which passed through the crucibles is understated in the above returns.

COAL GAS AS A FUEL FOR MELTING NON-FERROUS ALLOYS.

By G. B. BROOK, Lecturer in Non-Ferrous Metallurgy in the University of Sheffield.

In opening his paper, the author remarked that the use of gas for the melting of metals has always seemed to him to be ideal. He then gave particulars of a gas-furnace test, for which, in order to make it as drastic as possible, cupro-nickel (80 : 20) was chosen as the test alloy, in view of the high temperature required for this particular material. Every endeavour was made to ensure that the work should be on as large a scale as possible, closely following commercial practice, so that results obtained would be accepted by manufacturers as a guide to what might be expected in their own melting-shops. During the ten working days covering the period of the test, the total weight of metal that went through the furnace was 51 cwt. The material was subsequently rolled and passed on to the cartridge manufacturer, and made up into ·303 bullet sheaths. Every detail that might interfere with the success of the experiments, or the reliance to be placed on the results of the test, was eliminated, as far as one was able to foresee. The furnace consisted of a self-contained unit, pit-fired pattern, taking a 60-lb. crucible. The body was of cast iron, and the heating chamber insulated. The furnace lining consisted of specially prepared refractory bricks.

The main points which the author had in view were to ascertain: (1) Would ordinary (coal) gas give a temperature that was sufficiently high for the successful casting of cupro-nickel? (2) What was the relation between the coke-fired furnace and gas-fired furnace from the standpoints of cost of melting, speed of melting, life of crucibles, wear and tear of lining and burner, melting losses, labour charges, capital charges, and quality of metal produced; and generally the relative mechanical advantages and disadvantages of the two systems.

No difficulty was found in attaining the desired temperature, as a maximum heat of 1400° C. was readily obtained. The total gas consumption for the entire run was 46,125 c.ft. At the current price of gas in Sheffield (1s. 9d. per 1000 c.ft.), this would cost £4 0s. 6d. If, however, it were possible to secure gas at the rate allowed to users of gas-engines—viz., 1s. 4d.—the figure would be reduced to £3 1s. 6d. These figures represent respectively 31s. 9d. and 24s. 2d. per ton of metal melted. The average cost of melting over 400 tons of the same alloy in coke-fired furnaces was 36s. 4d. per ton. As to speed of melting, the results show that the time required to bring cupro-nickel to the necessary temperature for casting is much less than in the coke-fired natural draught furnace. Taking the average of the whole of the heats—that is, including the first three heats, during which experience was being gained—the figures would be:

Average time of 56-lb. heat in gas-furnace . . 52 minutes.
" " " " coke-furnace . . 82 "

In an ordinary working day of ten hours, it is rarely possible to get more than five heats out of a coke-fired furnace; but on two days during the gas melting test, twelve heats were secured in less than ten hours. Time is admittedly one of the most important economic factors in the melting of metals; and the results show very considerable advantage in the use of gas.

As far as can be gathered from the experience of practical men, one of the greatest disadvantages of the gas-furnace is the short life of the plumbago crucible under the "cutting" influence of the flame. The results of the author's experiments show that the wear and tear on the crucibles is not only contrary to this opinion, but that the crucibles had a longer average life in the gas-fired than in the coke-fired furnace. It was found to be quite possible to get as many as 22 heats, with an average of 17·6; whereas the life of the same make of graphite crucible used for this alloy in a coke-fired furnace was found over a period of six months to average 12·5—exceptional crucibles reaching a maximum of 16 heats. The length of life of the lining of the furnace is one of vital importance to the manufacturer producing high melting-point alloys; and the author fully expected to find this one of the weaknesses of the furnace. The results, however, showed that the lining had stood the test very satisfactorily. The condition of the burner also was quite good; and no tendency to deterioration was noticeable. The fact that the crucible in the case of the gas-furnace rests on a level and the stable base-plate, would lead one to expect that mechanical losses in charging and drawing would be less than in the case of coke. The percentage loss was found to be 0·40; and even this would seem to be capable of being still further reduced as the melter gained experience with the furnace. This represents a substantial saving compared with coke-furnaces, as only with the best practice can the loss in the latter be decreased to 1 p.ct. On a large installation, there would be a distinct advantage in favour of gas in the amount of labour required. Four coke-fired furnaces can be worked by three men. It would be possible to work a six-hole gas-fired battery with four men, even taking into account the extra mould preparation incident on the increased speed of gas melting. This would represent a substantial saving in labour charges. The capital cost (exclusive of the actual building) for installing a battery of gas or coke fired furnaces, capable of giving the same output, is:

Four pit-fired coke-furnaces, complete with separate flues and stack, 30 ft. high £280
Battery of four gas-furnaces, complete with blower, tank, and gauge, including cost of excavation £242

From these figures (calculated on present war prices) it will be seen that there would be very little difference in capital cost.

The working properties of industrial alloys must of necessity be the main consideration from the manufacturer's point of view; and it is very satisfactory to find that the report of one of the largest cartridge factories in the country showed that the material melted in this test was of better quality and resulted in fewer failures than any in previous use. Up to the final operation of pointing the bullet-sheath, not a single failure resulted out of the 30,000 cups taken for the test; and only in the last and most drastic operation of pointing was it found that 200 sheaths failed. This represents 0·6 p.ct.; whereas the average failures from the best material are not less than 0 8 p ct. It may be added also that, in the opinion of the roller, the material was excellent.

From the results of the test, the advantages in favour of gas as a fuel may be summarized thus: (1) The absence of dirt and accumulation of ashes. (2) The elimination of the difficult and wasteful process of "slagging." (3) Economy in fuel, in that between the pouring of each heat and the recharging of the pot, the gas is cut off. (4) The lining may be easily and even temporarily repaired in the middle of the day's run. (5) The loss of metal resulting from the accidental breaking of the crucible would be far less and more easily recoverable than in the case of metal similarly lost in the coke-fired type. (6) The actual cost of fuel is less when gas was used. (7) The speed of melting is far higher in the gas-fired furnace; and therefore the output over a given period would be substantially greater. (8) The mechanical qualities of the metal were superior to the average coke melted alloy. (9) The deleterious effects of sulphur and oxygen—which, however careful one may be, are never absent in the case of coke-melted metal—are less evident in the case of alloys melted by gas.

While the relative prices of gas and coke vary together, they do not do so always to the same degree in different districts. The following prices may be taken as averages in the districts stated. The relative cost of gas and coke melting are calculated on the figures found for gas and coke melting in the author's test adjusted for each district:

Town.	Special High Grade Coke, "Metallurgical" "Steel," &c	Gas (Minimum Rate per 1000 c.ft.)	Calculated Costs of Melting Cupro nickel per Ton (based on Ruling Prices for Fuel.)	
			Gas.	Coke.
	Per Ton.		Found.	Found.
Sheffield . .	40s. 3d.	1s. 4d.*	24s. 2d.	36s. 4d.
		1s. 9d.	31s. 9d.	
			Calculated.	Calculated.
Glasgow . .	About 40s.	1s. 5d.	25s. 8d.	36s.
Birmingham .	45s. 6d.	1s. 5d.	25s. 8d.	41s. 3d.
London . . .	50s.	2s. 8d.	48s. 4d.	45s. 5d.
		(Wandsworth, 2s.)	(34s. 3d.)	

* For use in gas-engines only.

The electrical energy required to run the blower during this test approximated 1s. 8d. per day.

METAL MELTING BY MEANS OF HIGH-PRESSURE GAS.

By C. M. WALTER, B.Sc., of Birmingham.

Dealing first with furnaces employing high-pressure gas with atmosperic burners, the author described a standard design of furnace, having a crucible capacity of 60 lbs., and suitable for the melting of brasses and bronzes for sand-casting work. The pressure at which gas is supplied to the injector-burner jet, he said, is usually 11 to 12 lbs. per square inch, at which pressure the requisite amount of air for combustion can be injected, and a mixture velocity of about 6000 ft. per minute obtained in the injector-throat; the actual velocity of the mixture entering the furnace being about 5000 ft. per minute. This figure was obtained with gas of a net calorific value of 500 B.Th.U. per cubic foot (equivalent to a gross value of 550 B Th.U. per cubic foot, which value was used throughout the paper), having a density of 0·52 (air = 1), and requiring 5 5 vols. of air for complete combustion. Taking the density of the mixture as 0·93 (air = 1), the velocity of the mixture in the throat of the injector cone corresponds to a static pressure of about 2 25 in. water gauge. When working with this mixture velocity, the combustion was sufficiently concentrated and the flame temperature high enough to meet all the requirements usually met with; temperatures sufficiently high for the melting of cupro-nickel being obtainable. But in cases where extremely high speeds of melting are required, the velocity of the mixture entering the furnace may with advantage be increased to as much as 9000 ft. per minute; this applying also where very high temperatures are required, as in the case of the melting of pure nickel.

There were next set out details of costs of melting brass in furnaces as described; the figures given having been obtained from large-scale tests carried out in foundries, which therefore take into account all the stand-by losses met with in actual practice. The figures of fuel cost given were in most instances based on the actual amount of metal melted. In the case of the melting of 60 : 40 brass in 50 to 60 lb. pots for sand-casting, it is found that, with gas having a net calorific value of 500 B.Th.U. per cubic foot, nine to ten heats of metal can be dealt with in a working day of twelve hours. The first heat usually takes about two hours, while second and subsequent heats should be ready for pouring at intervals of about one hour. For a 60-lb. pot furnace fitted with a single injector burner working with a gas pressure of approximately 12 lbs. per square inch, the average gas consumption would be about 280 c.ft. per hour, and the gas per pound of metal melted (60 : 40 brass) about 5 c.ft. In cases where the stand-by losses are high, owing to the moulds not being ready when the metal is ready for pouring, this figure would be exceeded.

Maintenance costs and the life of pots were dealt with; and afterwards Mr. Walter referred to metal losses. He pointed out that the

loss of metal during metal melting is a subject which should receive the most careful attention, especially when it is remembered that the value of the metal lost in such operations amounts, in some cases, to considerably more than the total fuel cost of melting. If the value of the metal lost during the process of melting be considered as a melting cost—which in reality it is—it will be found in many cases that where high-pressure gas-furnaces are employed, as compared with melting by coke in ordinary pit-furnaces, the economies effected, owing to the reduction in metal losses alone, more than outweigh the extra fuel cost involved. In order to reduce losses to a minimum, in the first place the regulation of the temperature should be under complete control, so as to prevent overheating of the metal and the consequent loss of spelter; secondly, the atmosphere in contact with the surface of the metal should be non-oxidizing, and if possible slightly reducing, in order to prevent the formation of dross; thirdly, the design of the furnace itself should be such that any metal spilt over the sides of the pot is easily recoverable. These requirements can be obtained only to a limited degree in the case of coke-heated furnaces, by reason of their design and principle of working; but with gas-heated furnaces they are easily obtainable. Figures obtained from various installations of 60 lb. coke-heated pit furnaces show that in the case of the melting of 60 : 40 brass for sand-castings the losses usually amount to 6 to 7 lbs. per cwt. of castings produced, as compared with 3 to 4 lbs. in the case of gas.

Table I. is a summary of the results of a day's test carried out in a foundry where twelve 50-lb. pot-furnaces are employed for the production of light and medium cored work. Although the figures of melting cost are considerably higher than would have been the case had the furnaces been working up to their maximum melting capacity, nevertheless the conditions of working are representative of what might be expected in an ordinary foundry, where, owing to the nature and

TABLE I.—*Record of a Test on Twelve 50-lb. High-Pressure Gas Brass Melting Furnaces.*

Foundry test on twelve 50-lb. brass melting furnaces.	(High-pressure gas.)
Meter at commencement	11,371,700 c.ft.
,, ,, finish	11,400,220 ,,
Weight of metal per heat	50 lbs.

Summary.

Total number of heats (twelve furnaces)	75
Total weight of metal melted (average 50 lbs. per heat) (1 ton 13 cwt. 1 qr. 26 lb.)	3750 lbs.
Total gas consumption for the day	28,520 c.ft.
Average gas consumption per heat	380 ,,
,, ,, ,, ,, cwt.	851 ,,
,, ,, ,, ,, lb. of metal melted	7·6 ,,

variety of the work dealt with, the stand-by losses must be necessarily higher than in the case of repetition work where moulding machines would be employed. The plant referred to had been working daily for twelve months prior to the tests being made; and with the exception of one furnace, no linings had been replaced. Further, other tests carried out showed that a figure of gas consumption of 4·5 c.ft. per pound of metal melted could be obtained when the furnaces were melting up to their full capacity.

Table II. gives a summary of the results of tests carried out in connection with the melting of 80 : 20 cupro-nickel in a 130-lb. high-pressure gas-heated pit-furnace, during which thirteen 84-lb. heats of metal were melted. The average gas rate per hour was 495 c.ft., and the average gas consumption per heat 792 c.ft.—corresponding to 9·4 c.ft. per pound of metal melted.

TABLE II.—*Summary of Results of Tests on Melting Cupro-Nickel in 130-lb. High-Pressure Gas-Heated Furnace.*

Summary of Tests on Cupro-Nickel Melting.

Furnace was a 130-lb. crucible furnace.
Gas calculated at 1s. 3d. per 1000 c.ft.
Consumption, 495 c.ft. per hour.

Average gas consumption per 84 lbs. melted	792 c.ft.
,, ,, ,, ,, 112 lbs. ,,	1057 ,,
,, ,, cost per cwt. melted	15·8d.
,, ,, cost per ton melted	£1 6s. 3½d.
,, ,, consumption per lb. melted	9·4 c.ft.

The next table gave the results obtained from tests carried out in connection with the melting of 72 : 28 cartridge metal. The total metal weighed-in consisted of 75 heats, each of 160 lbs., with 66 lbs. of extra scrap. The charge consisted of ingot copper, spelter, and scrap. The heats were made up to 168 lbs. in each case, by the addition of extra scrap and clean spillings from the previous heat, with the result that the total quantity of metal actually melted amounted to 12,600 lbs. The average consumption of gas per heat of 168 lbs. amounted to 1042 c.ft., which is equivalent to 6·2 c.ft. of gas per pound of metal melted. The average loss amounted to 0·59 p.ct.

Table III. is a summary of the results obtained with the melting plant referred to, taken over twelve months' working.

TABLE III.—*Summary of Results of Twelve Months' Working with Twelve 160-lb. Furnaces for Billet Work.*

No. of furnaces installed	12
,, used at one time	8
Capacity of pots	130 lbs.
Meter reading, Dec. 29, 1916	14,768,900 c.ft.
,, ,, Jan. 21, 1916	426,400 ,,
Total gas used	14,342,500 c.ft.
Total metal melted	1086 tons.
,, ,, ,,	2,432,640 lbs.
Gas used per lb. of metal melted	$\frac{14,342,500}{2,432,640} = 5·9$ c.ft.

Average life of pots = 28 heats of 110 lbs.

Maintenance Costs per Furnace per Annum.

Cost of fettling and re-bottoming		£5 7 0
Cost of re-lining with rammed ganister twice per year:		
One ton ganister	£2 0 0	
Labour	1 3 4	
		3 3 4
Burner cone replacements (four sets) at 5s. per set		1 0 0
Total maintenance cost		£9 10 4

Total metal melted per furnace per annum = approx. 160 tons.
Maintenance cost per cwt. of metal melted = 0·7d.

Table IV. is a summary of the results obtained in the case of a small plant consisting of two 60-lb. high-pressure gas pot-furnaces for sand-casting, and one 160-lb. furnace for metal mixing and scrap melting; the gas in this case being compressed on the premises. Owing to the whole of the gas for both the large and small furnaces being registered by one meter, it is impossible to give a dissection of the amount of gas used for each particular process.

The results of a large number of tests show that, in the case of the melting of brass of approximate composition 60 : 40 in high-pressure gas-furnaces, the gas consumption, allowing for all stand-by losses, amounts to approximately 6 c.ft. per lb. of metal melted in the case of ingot, strip, and billet work—the metal loss in this case being about 1·8 p.ct. of the metal melted; and to 12 c.ft. per lb. of castings produced in the case of medium and light cored castings—the loss in this case amounting to about 4 p.ct. of the metal melted.

TABLE IV.—*Summary of Results of Twelve Months' Working with Two 60-lb. and One 160-lb. High-Pressure Gas-Furnaces.*

Two furnaces used:
One 60-lb. pit furnace for sand-casting.
One 160-lb. furnace for metal mixing and running down scrap.
Metal melted = 62 : 38 brass.

	Lb.
Total finished castings produced	58,683
Ingot metal produced from scrap and new metal	32,595
Total ingot and castings produced	91,278
Ratio factor: $1 + \frac{\text{weight of returns}}{\text{weight of castings produced}} = 1·55$	
Total gas used	1,103,210 c.ft.
Gas per lb. of castings produced	12·00 ,,
Average pot life	30 heats
Average loss of metal on castings produced	4·1 p.ct.
Average loss of metal on metal melted	2·6 ,,
Total maintenance cost of linings (three furnaces)	£12 13s. 7d.

Table V. gives the comparative costs of melting brass by high-pressure gas and coke for the production of medium sand-castings, where the weight of castings produced is approximately equal to the weight of the returns (ridges and gits); the costs given being the costs per cwt. of castings produced in each case.

TABLE V.—*Comparative Furnace Costs of Melting 60 : 40 Brass in Coke and High-Pressure Gas Furnaces in 60-lb. Pots for Sand-Castings.*

Costs per Cwt. of Castings produced (R. = 2).

With High-Pressure Gas of Calorific Value = 500 B.Th.U. net,* at 1s. 6d. per 1000 C.Ft.	Pence.	With Coke at 25s. per Ton.	Pence.
Fuel cost. Taking 12 c.ft. gas per lb. castings produced	24·0	Taking 1 cwt. of coke per cwt. castings produced	15·0
Pot cost. Taking life as thirty heats per pot	8·0	Taking life as thirty heats per pot	8·0
Maintenance and repairs. Re-bottoming each week, and re-lining once each year	1·65	Fettling each week, and rebuilding once each year	2 04
Interest on capital outlay. At 5 p.ct. per annum, taking cost £25 per furnace	0·50	At 5 p.ct. per annum, taking cost £10 per furnace	0·20
Depreciation. Taking life as being ten years	1·00	Taking life as being ten years	0·40
Value of metal loss. Taking this as being 4 lb. and equal to value of castings at (say) 10d. per lb.	40·00	Taking this as 6 lb. at 10d. per lb.	60·00
		Cartage of ashes	0·50
Total costs	75·15	Total costs	86·14

NOTE.—From the above it will be seen that with gas at 1s. 10d. per 1000 c.ft. and coke at 15s. 6d. per ton delivered, the furnace costs would be about equal.

* Equivalent to approx. 550 B.Th.U. (gross).

Some remarks followed on the subject of the melting of aluminium and aluminium alloys, in connection with which Mr. Walter said the high-pressure gas-furnace has firmly established itself on the score of both efficiency and economy. One firm alone in Birmingham are taking as much as 25,000 c.ft. of high-pressure gas per hour, continuously, for melting aluminium alloys; over sixty furnaces being used in this one installation.

Many advantages gained by the use of gas as a fuel, as compared with coke, had, the author pointed out, not been taken into account in the figures of cost given, owing to the difficulty of assigning a correct value for the advantages so gained; but as such advantages, due to cleanliness, convenience, and ease of manipulation, must necessarily

reduce the labour costs involved in any melting operation, they should not be overlooked when comparing such a system with one in which solid fuel is employed. In the case of the figures of fuel cost given in the various tables, no mention had been made of the costs of compressing the gas used, owing to, in the majority of the cases referred to, the gas being supplied direct from a high-pressure gas-main at the full working pressure. Where, however, consumers requiring high-pressure gas are not in a position to obtain such a supply direct from the main, it becomes necessary for gas-compressing plant to be installed on the consumers' premises. In this connection, Mr. Walter gave a sectional elevation of a compressor unloader valve designed by him. In the case of a compressor dealing with 10,000 c.ft. of gas per hour, and compressing up to 12 lbs. per square inch, the cost of compressing plant would be about £300 (at pre-war prices); and the cost of compressing, including interest on capital outlay, depreciation, renewals, oil, waste, stores, labour and attendance, and power charges (assuming power to cost 0·75d. per horse-power-hour), would amount to approximately 1·75d. per 1000 c.ft. of gas compressed and delivered; the total gas dealt with amounting in this case to approximately 22½ million cubic feet per annum.

The paper concluded with some particulars of combined high-pressure gas and air systems.

METAL MELTING.

By H. M. THORNTON, M.I.Mech.E., and HAROLD HARTLEY, M.Sc., of the Richmond Gas Stove and Meter Company, Ltd.

The authors began by saying that the marked success achieved by furnaces employing coal gas as a fuel, in the heat treatment of metals such as steel, is proving of material assistance in the introduction of gas-fired, metal-melting crucible furnaces. Although it would be premature to claim that these latter are fully established, nevertheless they offer great possibilities. It was proposed to deal only with a furnace of the type intended for melting the metals of higher melting-point, from brass upwards, as they felt that in this direction coal gas and water gas are especially capable of giving the desired results. In working with coal gas, the fact must not be overlooked that, in terms of B.Th.U. available, the fuel is costing from four to five times as much as coke, assuming the gas supply to give 500 B.Th.U. per cubic foot net at a cost of 2s. per 1000 c.ft.; and even with water gas the fuel is considerably more costly per B.Th.U. than the coke which it is intended to replace. Starting with this disadvantage, the furnace manufacturer has either to obtain a markedly greater thermal efficiency out of his appliance or to effect economies in other directions—such as a decrease in the metal losses, greater life of pots, increased daily output per furnace, with a corresponding decrease in establishment charges per cwt. of metal melted, by a saving in labour charges or by a saving in foundry space, all of which tend to the desired increase in over-all efficiency, and can be translated ultimately into "£ s. d." It is probable that the cast metal prepared with gaseous fuel would give better results than that obtained by coke melting in those cases where sulphur content is an important factor.

In a reference to brass melting, the following results were given of six melts in a typical run:

Brass Melted.

(General scrap and ingots obtained previously from mixed scrap. Brass and air preheated.)

No. of Melt	1.	2.	3.	4.	5.	6.
Weight of metal charged (in pounds)	68	68	68	68	68	68
Including scrap	8 lb. 14 oz.	3–15 oz.	2 lb. 9 oz.	6 lb.	7 lb. 10 oz.	6 lb. 11 oz.
Amount of metal preheated	12	All	All	All	All	All
Gas.						
C.ft. per lb. of metal melted	4·93	2·09	1·78	1 66	1·60	1·40
Calorific value net	..	554·8 B.Th.U. per c.ft.			..	..
B.Th.U. per lb. of metal melted	2644	1121	955	891	858	751
Pouring temperature	..	990° C. to 1010° C.			..	..
Duration of melt (in minutes)	86	38	34	31	31	30
Weight of skimmings	..	..	10 lbs.		..	..

Sawdust added to decrease oxidation. No flux used. No zinc added prior to pouring.

The question of metal losses was dealt with at length; the authors pointing out, in the course of their remarks on this subject, that in an inert atmosphere the rate of loss of zinc from a given brass will depend on the temperature and the speed of flow of the gases over the metal. During melting, the process may be accelerated, owing to the oxidation of the zinc vapour, and consequent reduction of the partial pressure of the metallic vapour. The effect of this latter factor is decreased to some extent if the combustion of the gases is not completed in the pot-chamber, and still further if a covering of charcoal is employed. In the final heating stage, after the metal is molten, and when the greatest loss occurs, a crucible lid previously heated in the metal preheating chamber can be used to cover the pot and decrease the loss. Assuming that it requires in the respective furnaces 3 c.ft. of coal gas, or 0·5 lb. of coke per pound of metal melted, then if the gas is burnt completely to CO_2 in the pot-chamber, the volume of products (calculated at 0° C. and 760 mm.) will be about 14 c.ft.; whereas with the coke, if it burns to CO_2 there would be about 77 c.ft. of products, and if only CO were formed, about 45 c.ft. From some three to five times the volumes of products flowing through the gas-fired furnace pass through the coke furnace.

In brass melting in coke crucible furnaces the zinc loss is stated often to be large, in which case it must be an important factor, both from the economic point of view, which is of especial moment at present, and, unless corrected for prior to pouring, with regard to its effect on the mechanical properties of the resulting alloy. H. W. Gillett states that in current practice of brass melting 5 p.ct. of the original metal is lost; and later he says that reports of metal losses vary from 1 to 22 p.ct. Recently, in making up a red brass containing a little tin in four 50 lb. lots, the author found the average zinc loss not to exceed 3 p ct.

In connection with the determination of zinc loss on remelting yellow brass, the following tests were made: Two 70 lb. lots of works' scrap brass A and B were melted and cast into chills; sample ingots being retained for analysis. Batch A was then re-melted with a covering of sawdust only, cast into ingots, a test ingot withdrawn, and the remainder returned to the crucible, re-melted, and a further sample taken. This treatment was repeated; five remelts in all being made. In the last melt, after the pourers had proved the metal to be sufficiently hot for casting purposes, the crucible was left in the furnace for another half-hour; the temperature of the metal being raised steadily during the whole of this period. The second batch of metal B was treated in a similar manner, except that in this case a covering of common salt was employed, and no provision of charcoal made for the prevention of oxidation. In neither case was a crucible lid used.

Zinc Loss during Re melting.	*Per Cent. of Zinc Present Originally.*		
Melts No.	0 to 1	1 to 4	4 to 5
Series A	0·48 p.ct.	4·26 p.ct.	6·19 p.ct.
Series B	1·34 p.ct.	4·04 p.ct.	5·63 p.ct.

The loss occasioned by heating to 1180° C. was about 4½ times the average loss in each of the preceding melts—of from 990° to 1015° C.

The authors had occasion recently to carry out a series of melts with a red brass containing about 2 p.ct. of tin in 60 lb. lots. Only three successive melts were made on each occasion. The average results are appended, together with the gas consumptions for melting yellow brass under the same conditions.

Red Brass.

No. of Melt	1.	2.	3.
Weight of metal charged (in pounds)	60	60	60
Amount preheated	12	All	All
Gas.			
Consumption c.ft. per lb. of metal melted	6·10	2·43	2·14
Calorific value net	548 B.Th.U. per c.ft.		
B.Th.U. per lb. of metal melted	3256	1297	60
Duration of heating (in minutes)	98	38	1142
Pouring temperature	..	1090° C.	34

Zinc loss during two melts, per cent. of original content = 3·56.

	Cubic Feet per Lb. Melted.
Gas consumption (average for three melts):	
Red brass (pouring temperature, 1090° C.)	3·56
Yellow brass (pouring temperature, 990° C.)	2·95

Results of melting tests with copper quoted in the paper showed how important is the ability to load up the pot as much as possible, if the most economical melting is desired. Materially better results were obtained when the charge was mixed scrap and ingots than when only sheet scrap was handled. As to the thermal efficiency of the furnace discussed, it was stated that, with 560 B.Th.U. gas, the six brass melts were done at an average consumption of 2·25 c.ft. per lb. gross, equal to 1200 B.Th.U. per lb. of metal melted, from which it would appear that, roughly, the thermal efficiency of the gas-furnace is about five times that of many coke-furnaces. The results given were obtained in a gas-fired furnace, with an arrangement for preheating the metal prior to charging, and for preheating the air supply before it is admitted to the blast-burner. As to the advantages of this, the authors said that for brass melting the most suitable type of furnace to be employed will depend upon the number of melts daily, as when only a few are required the additional capital cost involved in the introduction of the preheating device may not be compensated for adequately by the gas saved. If the furnace is suitably constructed, the metal and air are both preheated to a considerably higher temperature in melting copper or cupro-nickel than when melting brass. If the use of a flux does not determine the length of life of a pot, the authors would expect a 50 p.ct increase in the pot life when a gas-fired furnace is substituted for one coke-fired—provided, of course, that the melter shows a reasonable amount of care in handling and loading the crucible. Finally, regarding increased output, it was remarked that, on the basis of figures given for brass melting, the average time for the actual melting operation is, for twelve melts of 68 lbs. each, 39 minutes, and for fifteen melts 37 minutes, making no allowance for the time required to pour. Under similar conditions, 55 minutes would probably represent an average for many coke-fired furnaces. With the gas-fired furnace cited, the average time for melting can be decreased three to five minutes by working at a higher consumption, without a decrease in the thermal efficiency of the appliance. To claim a saving of time for melting of 25 p.ct. with a gas-fired furnace, against ordinary practice with a

solid-fuel furnace, in the melting of brass, would not be excessive in the authors' view.

The metal melting referred to in the paper was carried out in a Richmond 70 lb. crucible furnace of the preheating type. The gas and air mixture is admitted through a suitable blast-burner and the lower portion of the combustion chamber, and is burnt in the annulus between the crucible and the furnace-wall. The gases, after travelling around the pot, are directed through the metal preheating chamber, and then pass on to the air-pipes, and finally to the flue. This arrangement enables a high degree of pre-heat of the metal to be obtained. The top of the metal chamber is on a level with the top of the pot-chamber, and is closed by a pair of lids. With this construction the operator has not to lift his metal above the foundry-floor level; and the transference of pre-heated material to the crucible is done with ease. The lower portion of the wall of the combustion chamber is constructed of suitably-shaped blocks of a specially refractory nature, to enable greater resistance to be offered to the combined action of high temperatures and spilt metal. The bottom of the chamber can be removed simply for the recovery of spilt metal.

SPEAKERS' REMARKS ON THE FOUR PAPERS.

Sir Thomas Rose, who opened the discussion, said that in reading the papers he had been struck by the enormous advantages that seemed to be universally found in the use of ordinary town gas as compared with coke for metal-melting, whether it was in the rather large pot that was used at the Mint or the smaller pots used elsewhere. Unfortunately, no data were given which would enable a comparison to be made between high-pressure and low-pressure gas, or at any rate it was difficult to make a comparison between the data for high-pressure gas as given in Mr. Walter's paper and that for low-pressure gas in the others. It would, however, appear that, comparing Mr. Walter's gas consumption with that at the Mint, high-pressure gas gave a higher figure than low pressure. For instance, the figure of 7·6 c.ft. of gas per pound of brass melted by Mr. Walter compared with 5·5 c.ft. at the Mint for metals which included about 25 p.ct. of cupro-nickel. Moreover, such an alloy was not so easy to melt as brass. On the whole, it looked as if high-pressure gas involved a greater consumption for cupro-nickel, although pure nickel was another matter, because he took it that when temperatures higher than those required with cupro-nickel were used, then high-pressure gas began to show an advantage, as would a combined high-pressure gas and air system. Did Mr. Thornton find that yellow flux with charcoal was the best thing for preventing the absorption of sulphur in a furnace? Further, what mould did he use to pour his metal into cast. His (the speaker's) experience with the moulds that he had used was that it was difficult to prevent some of the flux getting into the metal and making an unsound casting near the top. Perhaps it ought to be skimmed-off; but when using a very small amount of flux on a comparatively small scale, there was not much to skim. He would like some information on this point.

Dr. R. S. Hutton said the papers demonstrated that the melting of metals by gas had now passed the experimental stage, although there was an inclination towards feeling that this stage had not yet been passed. He would like to sound a note of warning to the gas interests. No doubt many people in the gas industry would welcome the publicity which the discussion was likely to have, as proving that coal gas melting had come, and come to stay; but he would like it carefully to be noted that if melting by gas had come to stay, and to be extended, it was very essential that the commercial requirements of the metal-melting industry should be taken into account. These requirements were such as to demand a very much better gas supply than was being given at the present time. He said this in no spirit of wanting to find fault with conditions—some of which were clearly due to troubles arising from the war; but as a consumer he had a strong feeling of resentment against the undue advantage which the gas industry had been able to obtain from the troubles of the country in the fact that they had now been able to legally standardize such a very low calorific value of gas. The pressure of gas also was vastly below what any far-seeing consumer of it would wish it to be. Hence he desired to sound a note of warning. He had always felt very strongly impressed with the way in which gas was wasted in a gas-furnace. After installing quite a good design of apparatus and quite an efficient one, it was handed over to a workman who generally had the crudest ideas as to the properties of gas and of its control. Usually the workman would depend upon some indirect property of the furnace—such as observing a flame emerging from some point really quite independent of the functioning of the furnace, and due possibly to a defect; and with coal gas of lower quality and higher price it was necessary to have some simple devices for controlling and adjusting it, which could be made available for relatively untrained users. He had recently been using a very simple device based on the Pitot tube for measuring gas and carefully recording it. He was interested in the suggestion in Mr. Thornton's paper, as to the advantage of preheating the metal, and not only preheating the metal but preheating the air, as leading to considerable economies. He was also struck with the almost record figures given in the paper, of very low gas consumption compared with some of the other authors, and which were partly accounted for by preheating the metal. Mr. Thornton and his co-author had in an appendix to their paper referred to a blast-burner, but had not given nearly sufficient description of the furnace. Perhaps they would add some information of this sort in the Institute's "Journal."

Mr. H. James Yates said that he was specially interested in Mr. Walter's paper regarding high-pressure gas, because the figures in it were confirmed by figures that he himself had obtained over a period of two years. For instance, for cupro-nickel the consumption was given as 9·4 c.ft. per pound of metal melted with high-pressure gas. With ordinary town pressure and air at about 3 lbs., and a similar size pot, this was equivalent to anything from 5·8 to 6·7 c.ft. Coming to common brass, the author gave the figure of 6·2 c.ft. per pound for 72/28 cartridge metal. With town pressure and air at 3 lbs., this could be done easily with 2·9 c.ft.; in fact, he knew instances where the furnace was run regularly on a consumption of 2·5 c.ft. per pound of metal melted throughout the day's run. The figures regarding length of life in Mr. Walter's paper also confirmed his own experience; and he would consider it very bad if he did not get eighty heats per pot. Although high-pressure gas had its own advantages, it was costly to instal, on account of compressing the gas, unless they happened to be in a town where high-pressure gas was available. The figures in Mr. Thornton's paper were interesting; but he wished that the results of commercial everyday practice had been given, instead of the results of experimental work in their own laboratory. Figures of 4·93 c.ft. down to 1·4 c.ft. were given for the first heat to the last; but it could not be suggested that this result would be obtained regularly, although he knew an instance where the men (working on a bonus system) got their heats out at 1·49 c.ft. average for the whole day. These, however, were figures he hesitated to give, because they were exceptional. Therefore, while Mr. Thornton's paper was most interesting, he (Mr. Yates) would have liked to have had the results of running on a commercial basis, because he had figures of a dozen and more cases where the gas consumptions were remarkably low in various parts of the country—running, per pound of metal melted, for cupro-nickel, as low as 5·8 c.ft. and the highest 8·5 c.ft. for 70/30, and with 70/28 from 2·9 to 3·5 c.ft.; with pure copper, 4·8 c.ft.

Mr. L. C. Harvey said the visual flame method of telling whether the furnace was really running all right, which was disliked by Dr. Hutton, was really the most practical test one could have. Mr. Walter referred to the necessity for having dampers in the flues, in order to ensure the proper working of the furnace. Without dampers, and using a large chimney and probably a heavy draught, the furnace was practically being exhausted, and more gas would be used than was actually needed. With a damper in the flue, and a small hole through the furnace-cover, it was possible to get a uniform pressure inside the furnace; and as long as there was a test-flame coming through the little hole, it was evidence of a reducing atmosphere inside and not an oxidizing one. From the foundry furnaceman's point of view, this was one of the best methods possible. The figures given in the table in Mr. Brook's paper could hardly be taken as giving the comparative cost of coke, oil, and gas. To begin with, a 30 lb. charge of yellow brass was hardly a commercial size, and a 200 lb. crucible in a pit-furnace would have been a better size. The three furnaces on coke, oil, and gas were not run at anything like their proper efficiency or proper capacity. The coke furnace had a 120 lb crucible, and the oil and gas 90 lbs. each; so that a 30 lb. charge did not give the highest efficiency of which the furnace was capable. Furthermore, the actual metal melted in these tests was not really brass at the close of the tests. Originally, the metal melted was made up of scrap copper and zinc. But it was melted over and over again, he did not know how many times; and at the close it could not have had the composition of brass, although no composition was given. The consumption of fuel for the coke furnace—66 lbs.—gave a furnace efficiency of 3·5 p.ct.; the oil furnace, on the consumption of fuel given, had an efficiency of 3·4 p.ct.; and the gas furnace, with a consumption of 383 c.ft., had an efficiency of 13·1 p.ct. Normally, to fire a proper size coke furnace would not need more than 30 lbs. of fuel, and the efficiency would be 6·7 p.ct. An efficiency of 6·6 p.ct. should be obtained with the oil-furnace working on a proper scale; and the gas-furnace would not need more than 300 c.ft. per 100 lbs. of 70/30 ingot brass. Thus the efficiency should be 16·7 p.ct. With a 600 lb. tilting furnace dealing with 70/30 ingot brass an efficiency of 20·1 p.ct. should be obtained with coke, 16·6 p.ct. with oil, and 20 p.ct. with gas, using 225 c.ft. per 100 lbs. of metal melted. He was not deprecating the author's tests, but desired to give the real efficiencies of the furnaces.

Dr. Walter Rosenhain, F.R.S., said there were one or two points in the papers that called for a little consideration. In the first place, if the claim that was made by all the authors for the high efficiency of the gas-furnace was correct, that in itself was a little surprising, because against the gas-furnace there was the fundamental principle first of the cost of converting the fuel into gas, and then there was the fact that in the ordinary gas-furnace, with air under pressure, a large volume of heated gas was being blown out into the air; and to this extent heat was being wasted. The impression he had—and it had been strengthened while listening to the papers—was that the ordinary coke-furnace was a very bad thing rather than the gas-furnace being a very good thing of its kind; and the moral he would draw was whether it was possible to improve the coke-furnace and make use of its thoroughly good and useful characteristics by employing the whole of the fuel without having to convert it into gas. He could not help thinking that some of the figures for coke-fired furnaces must be due to the heat losses which could be avoided by suitable design. Gas-furnaces had proved absolutely superior to all furnaces fired with solid fuel in the steel and other industries where the regenerative principle could be applied. Attempts had been made to do this in gas-furnaces for melting various alloys, and there, again, was a consideration worth bearing in mind. It was no use preheating either the gas or the air if this had to be done at the expense of heat taken from the furnace itself. This should only be done at the expense of the heat of the waste gases. True regeneration was a most efficient thing, which he could say from experience could be done with coal gas. There was no decomposition and no trouble in preheating the air. This had been done most efficiently, particularly for melting high temperature alloys. In regard to the temperatures attainable, one of the authors seemed to doubt whether he could melt cupro-nickel in a gas-furnace. He himself had reached 1650° C. with high-pressure air from 80 to 100 lbs. per square inch used in a rational manner as an injector. In this way, a high temperature burning in a small space could be obtained which was necessary for the melting of cupro-nickel. This particular furnace might prove of value when dealing with special types of alloy, such as nickel-chromium, which require an oxidizing high temperature well over 1400°. A point that had been overlooked in all the papers was the thermal conductivity of the materials of which the furnace itself was built. A large amount of heat developed inside the furnace went, not to melting the metal, but simply to heat the surroundings of the furnace and the foundry generally. This could be largely overcome by proper design and choice of materials. One required to know a great deal more about the properties of these refractory materials and the choice of the correct ones. In this connection, the material

zirconia was coming into use, as it was valuable in preventing the loss of heat by conduction through the furnace walls. This had to be employed with some discretion, because if the loss of heat through the furnace walls was prevented, the temperature of the inner surface of the furnace walls was increased, and the refractory lining might be destroyed. The reason furnaces stood up to their work so well at present was because they were efficiently cooled from the outside. He could confirm Mr. Hocking's suggested use of a wash of carborundum over the inner surface of the furnace—it seemed to prevent a relatively inferior fire-clay lining from melting down under conditions where it would otherwise do so.

Mr. H. L. REASON remarked that from reading Messrs. Walter and Brooks' papers one would think everybody should go universally for the gas-furnace; but his experience did not quite coincide with this. It was true that high-pressure gas was clean to use; but what of the noise? Then, on the question of economy, no doubt excellent results could be obtained by experts; but there were not always experts in the foundry. The air-gas furnace appealed to him on account of the lesser noise; and it seemed to score immeasurably when melting aluminium. Mr. Brooks took coke at 24s. per ton, and gas at 10d. per 1000 c.ft.; but in Birmingham, when gas was 10d. coke would be about 16s. The tests made by Mr. Brooks came out rather badly so far as cupro-nickel was concerned. He might have improved the result by putting on a little forced draught. The cost for the gas-furnace came out at about the same as for the coke-furnace; but it did not include the stacks for the high-pressure gas-furnace, which were as essential as with coke. He had an open mind on high-pressure gas-furnaces.

Mr. A. G. SMOAT agreed with Dr. Hutton that deterioration in the quality of gas was one of the troubles of people who had to use it for metal-melting purposes. Mr. Hocking made reference to adjusting the quadrant taps in the event of a lowering of the gas pressure. But had no attempt been made at the Mint to use a gas-governor? Also had deterioration in the gas pressure been experienced at the Mint; and, if so, what steps had been taken to avoid it, because if it were necessary to wait until the gas pressure dropped, considerable damage might be done to the crucible during the short time it was dropping (say) from 25-10ths to 22-10ths. Had Mr. Hocking comparative figures of the ordinary crucibles and the Morgan Salamander crucible referred to in the paper as specially suitable for gas-furnaces? He did not think it was good practice, as recommended by Mr. Hocking, when stopping the furnace, to close-down the gas-valve first and then the air, because by allowing air to get into the furnace during the time the gas was cut off would give an oxidizing flame in the crucible. He preferred to shut off at the same time both air and gas. The gas consumptions given in Mr. Thornton's paper were very low—about 2 c.ft. per pound of metal melted. It must be remembered, however, that only a 70-lb. furnace was being used; and his experience was that the larger the furnace the greater the gas consumption. Care should be observed in giving such figures, as they were liable to mislead. The same applied to the number of heats that a pot would give. This varied very considerably with the size of the pot. He would also like to know from Mr. Thornton whether the figure of forty-five to fifty melts out of a 70-lb. pot related to a period or only to experimental work; also was the number of heats with sand casting or chill casting, because the pot lasted very much longer with a sand mould?

Mr. HAROLD HARTLEY pointed out that Mr. Hocking's average gas consumption over a variety of metals was 5¾ c.ft. per pound of metal, and his coke consumption 0·55 lb. In other words, in ordinary commercial practice the gas consumption was 70 p.ct. higher than under the tests condition in Mr. Brooks paper—an enormous difference; and it was clear that there must have been a very large wastage of gas. Had Mr. Hocking gone into this and found out whether the wastage was greater with gas fuel than with solid fuel? Mr. Walter's figures were also high, and of the same order as Mr. Hocking's. In neither case was preheating of the metal or the air attempted, yet the figures were higher than would have been supposed with the ordinary type of crucible furnace without preheating. The results in these papers emphasized in a very remarkable manner the necessity for efficient control and rapidly working the metal.

Mr. C. W. SPEIRS said that the economical use of crucibles was just as important at the present time as the economical use of food, because the most important ingredient of crucibles came from abroad, and the difficulty of getting supplies might be a serious matter in the future. He was a strong advocate of the bonus system; for it was wonderful how the number of heats was increased with a bonus system at work. He did not think any one type of furnace was better than another, because it depended entirely upon the conditions and the uses to which they were to be put, and, unfortunately, the intelligence of the man. A practical point was that if the crucible was kept hot while pouring, the life of the crucible was doubled.

Mr. JOHN DEWRANCE said the advantages of gas melting were so manifest and apparent that, if the difficulties could only be overcome, it would be an enormous advantage to all parties. One of the chief advantages was that it saved loss through the metal being mixed with the ashes; and it also enabled double the amount of metal to be melted in the same space. Up to the present, however, it had not been possible to overcome the grave difficulties in the way. His experience, over a long period, with pots varying from 100 lbs. to 400 lbs., and all varieties of metal, was that as long as the gas-furnace was new and in good condition it showed enormous economies in the cost of melting, and in other directions. But the moment one went into the foundry, it was found that the gas-furnaces were out of use because they were burnt out. He could find nothing that would stand the heat of the gas; and this was not because his men were stupid. They were very expert in the use of gas-furnaces; and they had been taught by the greatest experts on the subject. It was simply due to the fact that with coke heat was being generated all the way up the crucible; whereas with gas it was all in one place. It was, therefore, necessary to have an enormously greater heat there; and for this reason there was nothing that would stand-up against it. The gas-furnace was not a practical thing at the present time, because of the difficulty of the refractory materials. It was, therefore, impossible to rely absolutely on gas-furnaces at present, because the whole foundry might be thrown out if this were done.

Mr. S. BRAYSHAW said that in one large works, melting cupro-nickel in large quantities, it was found that after the first melt the fuel consumption with gas-furnaces was between 6 and 7 c.ft. per hour of commercial work from day to day. At another large and extensive works, melting pure nickel over a period of eighteen months side by side with coke, it was reported that during the whole time coke cost 4s. 2d. and gas 1s. 9d. He himself could hardly have credited the figures; but they were given by the users. Statistics from quite a number of places with regard to the life of the pots showed that the average life of gas-fired furnaces was eighty melts. He could quote specific instances in which this number had reached a hundred and twenty in ordinary commercial work and handled by ordinary workmen. There was also a large plant, using 500,000 c.ft. of gas per hour (water gas), nearly all metal melting, in which very good results were being obtained. He was also tempted by what Dr. Rosenhain had said to add that Johnson-Matthey's had one of his firm's burners with which they attempted to weld a one thousand ingot of platinum, but found that the temperature was so great that it began to run. A few weeks ago he took the temperature all over a gas-furnace using gas from the main, and air at not more than 21 lbs., and obtained 1800°. This was strongly preheated, not regenerated; and the instrument was afterwards verified and found correct. In common with some of the previous speakers, he hoped the papers would be brought to one level; so that the various results could be compared. Mr. Hocking's paper stood out pre-eminently; but he objected to 2d. per unit for electricity. In his opinion, the future lies not with high-pressure gas, but with air at a few inches pressure, which meant an enormous cheapening of the plant, because a small rotary fan could be used. In this connection, England was on the threshold of great developments.

Mr. W. R. BARCLAY said that, after reading the papers, a manufacturer would be completely in a maze if he were contemplating changing from coke to gas or from gas to oil, because all the figures took no account of the human factor. Even with the same type of furnace in different shops it was impossible to get a uniform basis of comparison, because of the difference in the different workmen in each case.

Mr. CLIFFORD HIGHTON said that his investigations had not shown that he could improve on the results obtained with his old coke-furnaces. His total costs for melting considerably over 1000 tons of non-ferrous metal, including wages, bonus on output, repairing furnace every week, war bonus, &c., during war conditions when wages were up 30 p.ct., coke by 70 p ct., and crucibles by 40 p.ct., compared with five years ago, were 42·7s. per ton. He was amazed to find out how much lower he was on some items than the figures given by Mr. Hocking for the Mint. Crucibles had cost with coke, 39·8s. per ton and with gas 26·8s. at the Mint; whereas his figure last year with coke was only 8·8s. A ton of coke melted 1·8 tons of metal at the Mint, whereas in his case it melted 2·34 tons.

Prof. TURNER said it had been suggested that the consumption of gas given in Mr. Walter's paper did not represent actual practice; but it was the fact that some of the tests recorded in the paper dealt with more than 1000 tons of metal, and they extended over a period of twelve months. Furthermore, they were not conducted by experts; so that the question of expert guidance did not come in. As a fact, in discussing the results in the paper with Mr. Walter, he had found that he was rather afraid to give some of the figures which had been obtained by ordinary workmen in practice, because they were three times as high as figures which Mr. Walter had himself obtained in the laboratory.

Mr. A. B. ROXBURGH, referring to the difficulties with labour just now, said that he recently obtained the results from a plant running with gas for the last six months, and they were extremely high in gas consumption. On investigation, he was told that the man who did the work only ran one melt on Monday as a rule, simply because he did not turn up. On other days of the week he condescended to turn up at 8 o'clock and finished at 3 o'clock, and managed to get in four melts per furnace. The average consumption of gas was 766 c.ft. per cwt. of metal melted. This was with 70/30 metal for extrusion bars. Making copper castings, the average result worked out to rather less than 5 c.ft. per pound of metal melted. At Armstrong-Whitworth's works, there was a 12-cwt. gas-fired pot for melting swarf; and the results obtained showed a consumption of 12 to 14 c.ft. per pound of metal. It was found that the combustion space was far too great; and after reducing it the figure of consumption dropped to 5 c.ft. In another foundry, where they adopted gas melting for brass work eighteen months ago, they were putting down two more. This was partly due to labour and the difficulty of getting coke; but the greatest reason was the convenience of being able to make special castings quickly.

A National Gas-Safety Code.

The "Scientific American," of the 10th inst., says that the last annual report of the Bureau of Standards tells of the progress that has been made in the preparation of a National Gas-Safety Code, which is intended to cover all phases of the production, distribution, and utilization of gases, with a view to eliminating dangers to life and health, and fire hazards. The code will consist of ten parts, dealing with: (1) Manufacture, (2) distribution, (3) appliance design, (4) gas-fitting, (5) appliance installation, (6) natural-gas wells and field stations, (7) acetylene, (8) bottled-gas systems, (9) blast-furnace, producer, and gasoline gas, (10) utilization and information for users. The American Gas Institute has appointed twelve Committees to collect information on different topics and in different sections of the country; while the National Commercial Gas Association, the Natural Gas Association of America, the National Fire Protection Association, the American Institute of Architects, the National Safety Council, and the National Association of Master Plumbers are all co-operating in the preparation of the code. Part IV., on gas-fitting, is in an advanced stage of preparation and will be published first, as the need for this part is regarded as most pressing.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual General Meeting of the Association was held last Thursday afternoon at the Grand Hotel, Birmingham—there being an attendance of about forty members. In addition to the Inaugural Address of Mr. George Stevenson, of Long Eaton, the new President, some notes were submitted by Mr. W. Chaney, of the Saltley Gas-Works, Birmingham, on "Producer Gas and the Utilization of Coke Dust or other Low-Grade Fuel."

Mr. Charles H. Webb (of Stourbridge), the retiring President, occupied the chair during the earlier portion of the proceedings.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. W. G. S. Cranmer, of Willenhall) read the minutes of the previous meeting; and they were confirmed. He also intimated the receipt of a number of apologies for absence.

The Report and Accounts.

The report and accounts for the year 1916 were adopted, on the proposition of Mr. B. W. Smith (Walsall), seconded by Mr. J. W. Eagles (Whitwick).

The Committee stated that they regretted to report the death of Mr. G. A. Collins, of Dudley, who had been a member of the Association for many years, and also of one of the youngest members, Lieutenant C. V. Townsend, who lost his life in the service of his country. During the year, eight members were elected, two died, four resigned, and one ceased to be a member under Rule 15; the membership now being 114.

Report of the Commercial Association.—The Coal Question.

The President said he would call upon the Chairman to give them some information with regard to the report of the Midland Commercial Association.

Mr. J. Ferguson Bell (Derby), in moving the adoption of the report, said he would like to refer very briefly to one or two of the items in it. In the first place, they had to deplore the death of one of their members, Lieutenant Townsend, of Hereford, who was killed in action in France. He was one of the most promising of their younger engineers. His death was one more indication of the ordeal by fire through which the country was passing at the present time. The very flower of the nation was fighting for them; and the least they could do was to show their appreciation of the sacrifices thus made. They had also lost Mr. Collins, of Dudley, who passed away full of years, and respected by all the members. He had not taken a prominent part in the discussions, but was a regular attendant at the meetings of the Association; and they had always been glad to have his advice. The past year had been one of great strain and stress for all the members; but he ventured to think the Commercial Association had done something, at any rate, to relieve the difficulties by keeping the members well informed on all matters. Of course, their great trouble had been in connection with the supply of coal. In the early part of the year, members were very much perturbed about the renewal of their coal contracts. However, they got into communication with the Board of Trade and the collieries; and the result was that most of the contracts had been renewed for the same tonnage as in the previous year, though perhaps not always at the price allowed by the Coal Limitation Act. At the same time, it was pleasant to recognize that certain of the collieries had loyally carried out the terms of the Act. Others, of course, had been out to make what he considered unjustifiable war profits. Now, the coal mines had been practically taken over by the State; and they thought, from what they could see, that members should again be able to renew contracts for the same tonnage on the same terms as last year. There did not appear to be any reason to doubt this. What they did suggest to all members was that they should get their coal-stores filled as quickly as possible, as no doubt the stress would become greater as time went on. He would like to say that they as gas undertakings had been very seriously hampered in the renewal of their contracts by what appeared to them to be a rather unwise suggestion that the contracts should be limited to three months. It was stated that one large gas company had approached the Controller's Department with reference to their coal contracts, and had been told to proceed as usual, subject to any decision that the Controller may come to later.* He hoped this meant, so far as gas undertakings were concerned, that they would be able to renew their coal contracts for twelve months as previously. If not, he thought it would involve greatly increased labour and other difficulties. He had communicated with Mr. H. E. Jones, the President of the National Gas Council, and understood that they, with the Institution of Gas Engineers, had the matter in hand, and it was receiving their attention. He believed the National Gas Council suggested some little while ago that gas undertakings should use through and through coal. Those works situated near the collieries should, he thought, use slack and lower grades of fuel; but there would be difficulties in doing this for those further away. They must also bear in mind that most of the collieries had their own coke-ovens, and so required a very large quantity of low-grade fuel and slack for coking purposes. In fact, he had been obliged to take large screen coal, because the colliery people had been unable to supply other than house coal. So far as coke was concerned, it had been a good market during the whole of the year. Good prices had ruled; and in this connection he would urge that, now there was a "boom" in coke, they should take advantage of the fact to popularize it as far as possible, by not charging too high prices, so as to induce householders to remain users of it after the war. The statement of the President of the Board of Trade, that it would be necessary to use less coal in the future was encouraging to gas manufacturers, as they had been urging for a great number of years that consumers ought to use smokeless fuel. They could also save a considerable quantity of fuel by employing the most improved appliances. There had been a Committee appointed to go into the question of fuel supplies; and it had been stated on good authority that if people used the best available appliances, it would save something like 50 million tons of coal in this country. It was to be hoped, therefore, that consumers would employ the most satisfactory appliances, so as to secure the greatest advantage. No doubt, at the present time a very large quantity of coal was being wasted; and this waste meant not only the depletion of the national resources, but the pollution of the atmosphere.

* See the first editorial in last week's "Journal."—Ed. G. J.

Presentation to the late Secretary of the Section.

Mr. Bell, after some remarks on the question of the remuneration of labour, said he would like to refer to Mr. F. Lee, of Hinckley, who had acted as Secretary since the commencement of the Commercial Association. They were very sorry indeed that he had found it impossible to continue this work; and they felt that they could not possibly allow him to retire without offering him some tangible proof of their great appreciation of all that he had done. They had therefore taken the opportunity afforded by the last meeting to present him with a solid silver rose-bowl. Members would know that the monthly statement Mr. Lee had been in the habit of sending out—giving prices of coke, tar, liquor, spent oxide, and various other materials connected with the gas industry—was a mine of information. The Commercial Association was being generously supported in the Midlands; and the number of members at the end of the past year was 47.

Mr. Samuel Glover (St. Helens) said that, as one who was not a member of the Midland Commercial Association, he would have great pleasure in seconding the adoption of the report; and at the same time he wished to say a few words about the coal question from the Board of Trade point of view. This he proceeded to do—emphasizing the importance of gas undertakings purchasing coal from the nearest adjacent collieries.

The President having expressed the obligation the members were under to Mr. Glover for his remarks, some general discussion followed on the points that had been raised with regard to coal and labour. In the course of this,

Mr. Thomas Berridge (Leamington) said he had had a letter from the Secretary of the National Gas Council, in which it was stated that Mr. Milne Watson was going to see the Coal Controller, and endeavour to get his permission for gas undertakings to make twelve months' contracts.

Mr. Vincent Hughes (Smethwick), alluding to recommendations to buy coal locally, pointed out that in that particular district, although they were surrounded by coal, it was absolutely unsuitable for gas-making. They had to go afield for supplies.

The report was then adopted.

New Member.

On the proposition of Mr. J. Ferguson Bell, seconded by Mr. F. J. Ward (Knowle), Mr. W. E. Caton, of Oxford, was elected a member of the Association.

An Honorary Member.

The President said that, while they were on the subject of membership, it seemed to him the proper moment to bring forward a matter that had been in his mind for some time. It was with reference to Mr. J. S. Cranmer, of Stratford-on-Avon. As Mr. Cranmer was one of the first members, and was now retiring from service, he would like to propose that he be made an honorary member of the Association.

Mr. Berridge, in seconding the motion (which was unanimously agreed to), remarked that Mr. Cranmer had for many years been a regular attendant at the meetings; and the least they could do was to pay him the compliment suggested.

The New President.

The President said he had now come to his last official act as President of the Association, and this was to ask Mr. G. Stevenson, of Long Eaton, to take his place. He trusted Mr. Stevenson would have a happy year of office, and that there might happen in it what he had been hoping would occur during his own term—that is, the restoration of peace.

The Past-President Thanked.

Mr. Stevenson, who, on taking the chair, was warmly greeted, proposed a hearty vote of thanks to Mr. Webb for his services as President of the Association during the past year. In a quiet sort of way, he had been of much assistance, not least to members from some of the smaller undertakings; and he was quite sure he voiced the feelings of all present in saying they had been exceedingly glad to have Mr. Webb as President. They looked forward to further work from him on behalf of the Association.

Mr. B. W. Smith, in seconding, wished Mr. Webb many years in which to be of service to the Association.

The resolution having been heartily carried,

Mr. Webb expressed regret that he had not been able to do more. Conditions had, however, been abnormal; and what he had devoted himself to chiefly had been matters which were important having regard to the existing situation. For one thing, they had had the extraction of benzol and toluol thoroughly discussed. Other subjects had also been brought forward; and he thought they had derived a good deal that was of value from the papers that it had been possible to persuade

members to contribute. His great disappointment during his year of office was that he had not been able to invite the members to visit Stourbridge; but he was hoping that, when times became easier, an occasion might present itself for having two outings in a year—one a visit to the works of the President for the time being, and the other to Stourbridge.

DISTRICT REPRESENTATIVE ON THE INSTITUTION COUNCIL.

The PRESIDENT mentioned that last year he had the honour of being elected a member for three years of the Council of the Institution of Gas Engineers. In the ordinary way, the Midland Association elected the President as their representative; but on this occasion the Committee, having considered the matter, felt that as he (Mr. Stevenson) already had a seat at the Council, it would be a graceful act to re-elect Mr. Webb for the present year. It would be of no use to elect him (the speaker) in a dual capacity, and thus reduce the Association's representation on the Council.

The Committee's suggestion that Mr. Webb should be re-elected was then agreed to, on the proposition of Mr. W. CHANEY (Birmingham), seconded by Mr. J. PATERSON (Cheltenham).

REPORTS OF DISTRICT ASSOCIATIONS.

The PRESIDENT proposed, Mr. W. S. MORLAND (Gloucester) seconded, and it was agreed, that they should follow the usual custom of sending to members not in arrear with their subscriptions a copy of the annual volume of "Transactions of the District Gas Associations."

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty is to thank you for the honour you have done me by electing me to the chair of this Association—an honour I appreciate the more, bearing in mind the status of my predecessors, and hailing as I do from a comparatively small undertaking, where opportunities in many directions are naturally more limited. It will be my duty and pleasure during my year of office to give of my best to the Association.

Our annual meeting once again is held in the midst of the great war for Liberty and Civilization. The events of the war overshadow all others, and all of us are now assimilating new ideas which in normal times would have made little progress in a decade. The *camaraderie* among gas men is proverbial; but I think that the special efforts of our industry of the last two years have resulted in a still closer bond of fellowship amongst us.

We may modestly be thankful that gas undertakings are not "profiteering" by the war; but that the nature of our business, always of public necessity and utility, has been such as to assist in these serious times, among other things, in the provision of raw materials for the manufacture of high explosives, and to afford the enormous advantages of a quick, clean, and certain service for many processes in the manufacture of munitions—a marvellous development whose extent and value are mainly due to the manufacturers of appliances.

TAR-WASHING AND OIL-WASHING.

It is a satisfaction to record that the Association (through the medium of its valuable Commercial Section) voluntarily organized its resources in June, 1915, to assist those responsible for the initiation and working of the "C" process. With a few notable exceptions, every gas-works within the ten counties comprised in our district is doing its bit willingly (and which willingness has quickened as time has gone on); and, while fully appreciating the great efforts of the larger works, I would like to specially mention those of the smaller undertakings, handicapped as many of them are in many ways. In order to keep up returns, many of these deliberately sacrificed "make per ton" in the national interest. At an earlier period, when quickness of adaptation was important, it is possible that the smaller works were of supreme assistance in the situation.

Notwithstanding difficulties of many kinds—chief among which is the naphthalene difficulty—the "C" process has done and is still doing good work; and when "straight" coal gas is made in horizontal retorts, good results are obtained. I mention these points because the later advent of oil-washing with its greater certainty, may have a tendency to discourage those who cannot at present adopt this process. To guard against naphthalene troubles at our works, we wash in a primary Livesey washer, using water gas tar in a second washer and vaporize paraffin at the governor outlet.

We all, I am sure in these times, fully realize our own individual responsibility to our country in our own circumstances. There is no lack of willingness; but there is a lack in many cases of material and labour to carry out our proposals. Those of us with tar dehydration plants have little difficulty in adapting them for debenzolizing the wash-oil; while for those possessing no such apparatus it has been shown that small plants may be easily erected and successfully worked.

The immediate necessity is the provision of larger and larger quantities of benzol for national purposes; but there is every indication that *post*-war demands will also be on an enormous scale. With so many scattered works, which by this time will be equipped for producing the crude primary products of tar distillation, the questions of central refineries and commercial organization for their disposal are all-important. For many of the smaller works, the difference between success and failure may depend upon their proximity to the nearest rectification works. From practical experience, I suggest co-operative effort in the selling of the products, while in special cases it might readily be arranged for one central works to deal with the whole of the products of the district.

While on the question of washing processes, it is a pleasure to acknowledge the valuable paper presented by Mr. T. E. F. Rhead (M.Sc.), of the Birmingham Central Laboratory, to the Midland Junior Section on Jan. 25 last. This is just the topical kind of paper which is so helpful at the present time—stimulating interest, inquiry, and personal experiment. I think also the industry is fortunate in obtaining at this time the co-operation of the Universities in the analyses of samples of tar from the various works. Let us hope that this valuable assistance is but a prelude to further help in the investigation of many of our problems in the future.

At our last annual meeting, I gave some rough notes on the use of unburnt limestone for increasing the naphthas in the tar. With due respect to the contrary experience of other works, our results were continuously good as regards the primary objects in view (as well incidentally as on other points), and subsequent independent expert investigation has proved that there is "something in it." The evidence now seems to be conclusive that the effect of limestone admixture so alters the rate of evolution of gases, that less decomposition occurs—resulting in an improved quality of both gas and tar. The effect of sulphur in the gas was very striking; and this alone was invaluable. We have, however, suspended the process for a reason not entirely unlooked for—viz., corrosion of the interior of the retorts. This may be due to the presence of salt in the coal used, or to the well-known action of lime on firebrick work. Special investigation is being made on these points, with the details of which, though very interesting, I will not weary you. If, as I expect, this drawback can be overcome, I shall have no hesitation in again resuming the process.

THE NEW GAS STANDARD.

Consequent on benzol extraction, the official substitution of a lighting standard by one of 500 B.Th.U. calorific value marks an epoch in the industry. There is abundant proof that the heating value of the washed gas is only slightly affected as compared with the luminosity. The Long Eaton standard is 14 c.p. with the No. 2 burner. But for many years we have assumed a calorific value test; and in this connection one is glad to testify to the great usefulness of recording calorimeters, &c., when calibrated daily against the standard types.

Though about 15 p.ct. of our output is absorbed by flat-flames, our experience suggests that a 500 B.Th.U. gas gives satisfaction with the new burner; but we expect to get (and, in fact, do get) trouble with anything much below this figure. There is a big difference between a 500 B.Th.U. straight washed gas and one of the same heating value accompanied by 20 to 30 p.ct. of inert material. We have recently had figures claiming that the flame-temperature of such a gas is only slightly reduced; but even so, the supply is in my opinion against the true interests of gas undertakings in active competition with live opponents. This question is of the utmost national importance. But it must be remembered that no exact uniform standard will find general approval. In the interest of both buyer and seller, there are economical limits to be ascertained. In our case, the supply of non-luminous gas would immediately mean the sacrifice of such a proportion of the output as could only be recovered by great capital expenditure—if even then.

The higher standards are gone beyond recall; and there is much to be said for a straight coal gas of 450 to 500 B.Th.U. But in my district I see no practical or economic prospect of a gas much lower than this, if the quality is to remain at all constant—a necessity increasingly important. It is always to be remembered that we are selling heat units in a given quantity of gas at a given price; and from the buyers' point of view there is a limit to adulteration. In the present special circumstances, occasional deviation from working standards is inevitable; but I hope and believe that our electrical friends will not make capital out of our difficulties. It should be impossible to-day for any gas consumer to substitute electricity on account of the impoverished gas supply; but I hope any such case will be brought to light at once, so that we may not be "victimized for our efforts and penalized for our patriotism" by the loss of business from causes beyond our control.

COAL AND LABOUR.

Much has been said and written on these two topics, which have been the main cause of our difficulties during the past year. The effects of the Coal Prices (Limitation) Act, while not Utopian, have undoubtedly steadied the market; and now that the Government has assumed control of the mines, our position at least should be no worse. But by now, I fancy that most of us have found out from the coal trade, who are our friends and otherwise, both of whom we shall remember "the day after to-morrow."

The shortage of labour will probably become more acute; and on both this and the coal question, while there are undoubtedly many cases of individual hardship, I am of opinion that there is more to be hoped for from the representations of a united industry (through the medium of the National Gas Council) than from isolated action. It is then for the authorities to assess the relative national importance of our industry, and for us to acquiesce accordingly.

One of the results of the present cataclysm of war will be a revolution in the industrial life of our country. The three wants of both employers and employed have been thus suggested by

Mr. Neville Chamberlain, of Birmingham, and they are worth more than "passing thought."

Wants by Employers.	*Wants by Employed.*
1. The utmost effort in production.	1. A greater share in the wealth created.
2. Certainty of service.	2. Regularity of employment.
3. Reasonable notice of demands for increased pay.	3. Improved conditions of life at work and at home.

This is not the time to discuss the bearing of these proposals as affecting the gas industry; but it is certain that higher wages will have to be paid to all workers, whether by brain or hand.

WORK AT LONG EATON.

My own experience has exemplified the vitality and the broad basis of the gas business. The local authority commenced the supply of electricity in 1904, after refusing the option given them by Parliament of purchasing the Gas Company's undertaking, on the ground (openly expressed) that their new venture would in a few years result in the gas-works becoming "derelict." Such has not been the case, although no effort has been spared on their part to accelerate the process of wreckage!

It is interesting to notice the respective progress of the rival services. From 1904 to 1915 the quantity of electricity sold has increased five-fold; the load factor has been as high as 26·46 p.ct.; and the average selling price has been 1·3d. per unit with special rates of ¾d. and 1d. per unit for power and heating and cooking respectively, less 5 p.ct. discount. The gas output for the same period, while admittedly not showing the same rate of progress, has increased from 85 to 144 millions; and the price has been brought down to as low as 1s. 10d. for lighting and 1s. 4d. for power purposes—the latter always for cash monthly.

It may be remembered that my Company successfully contested the validity of some of the Council's efforts to obtain business; and we have been brought perhaps sooner than many into conflict with conditions which will in future become more usual.

It may not be generally known that under section 6 of the Electric Lighting Act, 1909, it is possible for an electric lighting authority to obtain from the Board of Trade a Licence to supply specific premises outside their district though in the district of a competing gas company. We have had two such cases. In each area we had obtained (at great expense) powers of supply, and were willing and expected to supply gas. The application for a licence is not required to be advertised, nor notice given to the gas supply authority, who have therefore very little chance of objection. In the interest of gas undertakings, more publicity ought to be required. Up-against such competitive conditions in a limited area, one may often reflect on gains and losses, and their significance for the future.

For many years we have adopted a forward policy with gas apparatus of all kinds—nevertheless remembering, from experience, the necessity of keeping such records as permit of the "weeding out" of unproductive free appliances, and thus releasing unprofitable capital.

The lighting of lace machines by incandescent gas is a most difficult problem; and we have spent a lot of time and money on various trials. By the adaptation for high-pressure gas of an ingenious electric lighting pendant, we have, however, been able not only to retain business, but in several of the most modern mills to recently displace electricity altogether.

The distribution and selling of gas are of increasing importance; and in the future they will probably dominate and determine its manufacture. While time does not permit me to deal at length with this subject, I would say that the standardization of burners, mantles, and all fitments for fires, cookers, and other apparatus is inevitable, and now long overdue.

Our works contain nothing heroic, but have been entirely remodelled during the past few years. The retorts are horizontal, Klönne regenerators with one ascension pipe only (which has not given us the extra sulphur, as has been suggested). Ten years since we adopted the De Brouwer stoking machinery, with the unjustly abused hot-coke conveyor and coke-handling plant; and the results have enabled us to largely reduce the selling price of gas and otherwise strengthen our position. The capital outlay for the plant was in a few years entirely recouped by the saving effected; and in these circumstances it would be difficult (all costs considered) to improve the present system of carbonizatioa.

We enjoy the advantage of ample plant for condensing, scrubbing, washing, purifying, and storage; and by working steadily towards a definite scheme for the manufacture and disposal of residuals with a minimum of labour, we have of late years been able to obtain an average net return of about 90 p.ct. of the cost of coal.

THE OUTLOOK.

At the present time, when everything seems to be in a state of change, it is not easy to envisage the future of our industry. Competition for business in all directions will become keener; but the varied services which town gas can best render to the requirements of modern civilization make it extremely unlikely that there is any finality to its usefulness.

With the prospect of a national programme for stimulating and encouraging increased efficiency in all branches of industry, the problems of fuel and fuel disposal are of vital importance; and in these directions the gas industry has great potentialities.

Scientific investigation and research into the problems which still require solution will be increasingly necessary; and on each of us, dealing as we are with Nature's bounteous gift of coal, is imposed the responsibility to our country, the undertaking which we represent, and to ourselves, of working harder than ever towards the goal of the highest possible efficiency.

THE PRESS.

We are under great obligation, which is seldom expressed, to our Technical Press. Always providing for us an invaluable record of current events and a continual feast of technical subjects, it has during this wartime excelled itself. In my opinion, no industry is better served.

CONCLUSION.

Time and your patience preclude notice of other topical subjects; but I express the hope that they may be dealt with, at subsequent meetings, by means of short papers.

The President Thanked.

Mr. Webb, in proposing a hearty vote of thanks to the President for his address, said he would like to draw attention to two paragraphs, just to show what a self-effacing man Mr. Stevenson was. The address said: "It is a satisfaction to record that this Association (through the medium of its valuable Commercial Section) voluntarily organized its resources in June, 1915, to assist those responsible for the initiation and working of the 'C' process." Who did the great bulk of the initiation? Mr. Stevenson. Again: "It may be remembered that my Company successfully contested the validity of some of the Council's efforts to obtain business." This said very little; but many of them knew the immense amount of work, and courage, and ability that were required in order to carry the matter to a successful conclusion.

Mr. S. Glover seconded, and said it was an address which throughout its length upheld the importance and the honourable position of the gas industry. It was full of Stevensonian thought and gracefulness of manner.

The vote was carried by applause; and, in response,

The President assured the members that anything he might have been able to say was but a poor repayment of the many kindnesses he had received at their hands.

Sympathy.

Mr. Hughes remarked that there was one esteemed member of the Association whom they very much missed from the meeting—Mr. H. E. Copp. As many of them were aware, this absence was caused by the burial of his only son, and he (the speaker) thought the Secretary might send on to Mr. Copp an expression of their sympathy with him in his grief.

The President said their thoughts were with Mr. and Mrs. Copp in their trouble; and he was quite sure there was no need for a formal resolution. They might leave it to the Secretary to convey their sympathy.

The Committee.

The President pointed out that Mr. Chaney having become Vice-President, the Committee had decided to nominate in his place on the Committee Mr. R. J Meiklejohn, of Rugby.

This was confirmed, on the motion of Mr. W. C. Jones (Brierley Hill), seconded by Mr. J. R. Duff (Banbury).

Producer Gas and Low-Grade Fuel.

Mr. W. Chaney, of the Saltley Gas Works, Birmingham, read a paper entitled "Notes on Producer Gas and the Utilization of Coke Dust or other Low-Grade Fuel." This, with a report of the discussion, will be found on p. 607.

The author was accorded a hearty vote of thanks for his contribution.

At the close of the meeting, the members, on the invitation of the President, took tea together.

The "All-Gas" Kitchen.

Readers will remember the actual working costs of installations in "all-gas" kitchens which were quoted by Mr. W. L. Westbrook, of the North Middlesex Gas Company, in a paper read by him during last session before the London and Southern District Junior Gas Association. The figures he gave were particularly useful, referring as they did to houses of different rents, and installations of various kinds. The value of Mr. Westbrook's contribution has been further emphasized by its inclusion, with the illustrations, in the March number of "A Thousand-and-One Uses for Gas," issued by the British Commercial Gas Association. This is a special all-gas kitchen number; and, in addition to the paper just alluded to, there are some photographs of complete installations, to meet both large and small requirements. The number, in fact, contains ample evidence to support the statement made that the all-gas house is no longer in the experimental stage, but has established itself as a well-recognized and practical form of dwelling. As a supplement, some photographs are given of recent installations which illustrate the use of gas for industrial purposes.

Summer Time.—The Government has now definitely decided that "summer time" shall be reintroduced this year (as recommended by the Home Office Committee) throughout the United Kingdom, beginning at two o'clock in the morning of Sunday, April 8, when the clocks will be put forward one hour, and ending at two o'clock in the morning of Monday, Sept. 17.

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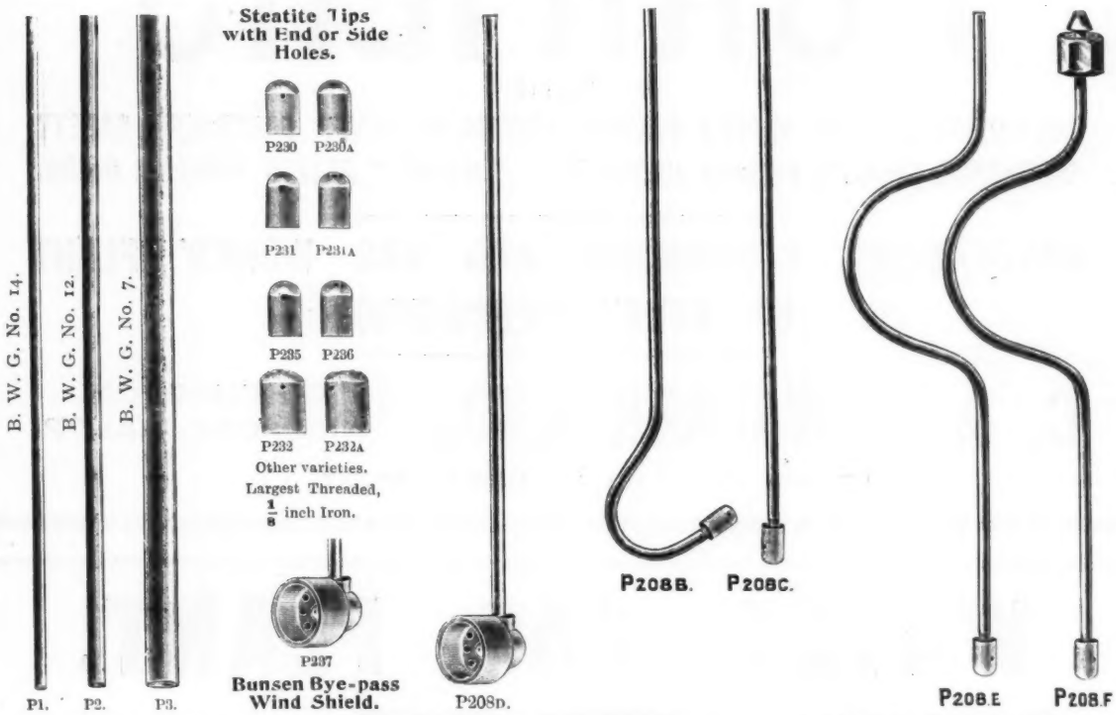

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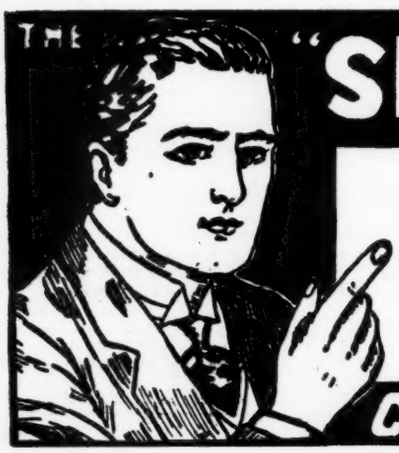

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ON PRODUCER GAS AND THE UTILIZATION OF COKE DUST OR OTHER LOW-GRADE FUEL.

By W. Chaney, Engineer of the Saltley Gas-Works, Birmingham.

[A Paper read before the Midland Association of Gas Engineers and Managers, March 22.]

The necessity of exercising economy of fuel is now a matter of national importance. Strenuous efforts are being made to control the wasteful employment of coal; and greater attention is being paid to the utilization of fuels hitherto looked upon as of little commercial value.

It is perhaps only since the war that more consideration has been given to the use of coke and breeze for the generating of steam; and probably the difficulties often experienced with the combustion of these fuels is due to the varying quantities of moisture they contain. Hot coke immersed in water and allowed to drain may contain 20 p.ct. of water mechanically held. This moisture has first of all to be evaporated before combustion commences; so that a considerable amount of latent heat is lost.

Every different type of fuel necessitates a different set of conditions for its efficient combustion; the primary object being the conversion of the solid fuel into a combustible gas.

Many attempts have been made to utilize coke dust—*i.e.*, all the material passing through a ⅜-in. riddle; but this cannot be burned satisfactorily in a furnace primarily designed for the burning of coke and breeze.

Briquetting has, I believe, been fairly successful; but such fuel is hardly suitable for fast steaming, such as is desired in an electric generating station. Moreover, in ordinary times, the price of pitch considerably enhances the cost of its manufacture.

An outlet may be found for the coke dust by its gasification in independent outside producers, and the gas so made utilized for heating retort-settings, coke-ovens, for generating electric current, or for other purposes.

Briefly described, the outside producer is somewhat similar in design to the ordinary water-gas generator, with the exception that the bottom of the producer is sealed in a water lute, into which the ash and clinker descend. A continuous supply of air and exhaust steam is blown through the producer; the calorific value and amount of ammonia in the gas so formed being dependent upon the quantity of exhaust steam admitted with the air.

This gas leaves the top of the producer at a temperature of about 500° C. It may be used direct, or the ammonia may be recovered by passing the gas through weak sulphuric acid in an absorber, in which case the temperature is reduced to that of the atmosphere before it can be finally used for heating purposes. It follows, therefore, that the highest heating efficiency is obtained when the gas is used direct from the producer, and under non-recovery conditions; otherwise there is a loss of sensible heat due to cooling, &c. Experience, however, has shown that when the gas is taken direct from the top of the producer, tar and dust troubles ultimately develop.

The removal of these troubles necessitates the cooling of the gas; but the value of the ammonia recoverable more than compensates for the loss of heat efficiency. The flame temperature of the cold gas is, however, such that for heating purposes some system of regeneration or fire-heating is advisable to obtain the highest efficiency. It is quite possible by this means to consistently and regularly get a temperature of 1400° C. Such a scheme is now in operation at the Saltley Gas-Works, in connection with the heating of coke-ovens—the whole of the coke-oven gas being utilized for town lighting, &c.

The fuel usually employed for producer work is a coal slack containing a proportion of nuts. It will generally speaking contain about 13 p.ct. of ash; the calorific value of the slack being 12,500 B.Th.U. per pound (dry).

Gas engineers usually express the fuel required for heating purposes as a percentage on the coal carbonized. Such a method is hardly comparable, and would perhaps be better expressed if a calorific basis were adopted.

With the ordinary internal-fired retort-setting, 12 p.ct. of fuel used on the coal carbonized would perhaps be considered as an economical figure; and for the heat losses due to cooling, &c., this figure cannot be attained by heating with outside producers. There are, however, some other factors for consideration, whereby the utilization of a cheaper fuel—such as coke dust—may considerably increase the actual consumption of fuel, but improve the economical effect. The dust is more or less of little commercial value; and in many large towns it is necessary to pay tipping charges to dispose of the material.

The calorific value of the dust is approximately 10,000 B.Th.U. per pound (dry), and the nitrogen content 1 p.ct.; the actual sulphate of ammonia recoverable being 45 to 50 lbs. per ton. It may be safely assumed that from 3 to 4 p.ct. of the total coal carbonized for gas-making purposes in this country represents the quantity of coke dust made; so that large quantities of sulphate of ammonia are available, and which at the present moment are neglected. Gasified alone, the coke dust yielded 95,000 c.ft. per ton; the calorific value of the gas being 114 B.Th.U. per cubic foot. Unfortunately, the throughput per producer diminished to such an extent as to jeopardize the heats of the coke-ovens, and the test had to be discontinued.

At the present price of sulphate of ammonia—viz., £16 per ton, the value of the ammonia recovered per ton of dust was 7s. 2d.—less, of course, the manufacturing charges.

Where tipping charges are involved, it is a debatable problem whether it would not be a paying proposition to gasify the dust solely for the recovery of the ammonia. By mixing 40 p.ct. of coke dust with the producer coal, the heating value of the gas is increased to 130 B.Th.U. per cubic foot; and the average price of the mixture is correspondingly reduced.

Assuming 17s. 6d. to be the present price of the producer coal, 60 p.ct. of 17s. 6d.	10s. 6d.
Coke dust, 40 p.ct. at (say) 1s. per ton . . .	0 5
Average price of mixture . . .	10s. 11d.

The additional revenue from the sulphate of ammonia recovered per ton of the mixture would be 69 lbs. at £16 per ton, 9s. 10d.—reducing the cost of the producer fuel to 1s. 1d. per ton. To this latter figure has, of course, to be added the increased expenditure of fuel due to heat losses, and to extra manufacturing charges.

As regards increased expenditure of fuel, 12 p.ct. for the ordinary internal method of heating retorts would be practically increased to 24 p.ct. with outside producers, using 40 p.ct. of coke dust and 60 p.ct. of producer coal. So that 2 tons of this producer fuel, costing 2s. 2d., would set at liberty 1 ton of coke at (say) 24s. per ton.

The manufacturing costs are somewhat complicated—much being dependent upon the amount of exhaust steam available. For every ton of fuel gasified, 2½ tons of steam has to be supplied. But 1 ton of this is recovered by the cooling of the producer gas; and the remaining 1½ tons has to be obtained from other sources. In the Saltley installation the exhaust steam from the electric generating plant supplying power to the coke-ovens is used for this purpose. It is, therefore, somewhat difficult to apportion the amount to be charged for generating electric current or for gas producer purposes. By arranging the steam-driven electric generators so that the exhaust therefrom balances the quantity required for producer gas making, and taking up any surplus requirements of electric power by means of producer gas driven engines, the cost of current is reduced to a very low figure per unit.

That the manufacturing costs with outside producers are considerably higher than the ordinary method of heating retort-settings cannot be denied; but the large margin between the cost of the producer fuel and the value of the coke displaced, warrants careful consideration of this system of heating by the members of the gas industry.

Generally, the advantages of the outside producer are:

The closing-down or reduction of the producer gas when standing-off retorts.
The utilization of the coke dust.
The recovery of the sulphate of ammonia.
The generating of cheaper power.
Regular heating of producer gas as compared with the variable gas constituent of the ordinary generator.
Less combustibles in ashes and clinker.

With the ever-increasing demand for sulphate of ammonia, it behoves gas undertakings and consumers of fuel to consider the adoption of plant that may enhance the output of sulphate of ammonia and reduce the cost of fuel.

DISCUSSION.

The President (Mr. G. Stevenson, of Long Eaton) remarked that Mr. Chaney had given them a paper which was of live interest at the present time.

Mr. J. Ferguson Bell (Derby) congratulated Mr. Chaney on having come before the Association with a paper. It had, he said, been a matter of extreme regret to the members that those in charge of the Birmingham gas undertaking had not of recent years been so prominently identified with the Midland Association as was the case ten or fifteen years ago. He hoped Mr. Chaney coming forward meant that in future they would see more of the Birmingham engineers in their midst. They were in charge of very large and important undertakings, and could give those who had control of smaller works a vast amount of information. Therefore they cordially welcomed Mr. Chaney, and thanked him for his instructive paper. It dealt with what certainly was, as the President had said, a live subject at the present time. Anything which could reduce the quantity of fuel used, and help them to conserve the national resources, was of the utmost importance. He (Mr. Bell) was in the position that he had no breeze or small coke to dispose of. He used for the purpose of steam generating the whole of his small coke, and did it by means of the provision of large boiler power. [Hear, hear.] It seemed to him it was a question of boiler capacity to a very great extent. With boilers which were small for the work required, it was imperative to use a higher grade of fuel. But he had adopted Lancashire boilers, 9 ft. × 30 ft., working at 160 lbs.; and with these he had no difficulty in using the finest breeze. They were fitted with Bennis furnaces. They first tried automatic feeders on the boilers; but the wear and tear on the feeding arrangement was so high, that it was more economical to just put the fine fuel in by hand in the front of the furnace, and the moving bars automatically carried it forward and clinkered the furnace. The plant described by Mr. Chaney meant almost another gas-works. It might be all right for a works the size of Saltley, where they had skilled chemists and a number of highly-trained assistants; but he was afraid that, for a great majority of undertakings, the addition of Mond gas producers would mean an expenditure of capital and a provision of technical skill which it would be found difficult to meet. The author told them that he valued the coke saved at 24s. per ton; but this must be regarded as an abnormal price. Many of them could recall when they were glad to get rid of coke at 10s. a ton. The

price of sulphate to-day was £16, but acid was something like £7; and again, the £16 was an abnormal price, which would further modify these figures in ordinary working. What was Mr. Chaney's opinion of the result of working this proposal with sulphate at (say) £12 per ton (which would be considered a normal price), and with coke at (say) 12s. per ton at the works? The author had dealt most fairly with his subject; he had put the advantages and also the disadvantages very clearly before the members. One of the disadvantages, it seemed to him, that had been presented was the fact that the 12 p.ct. of fuel for the ordinary internal method of heating retorts would be practically increased to 24 p.ct. with outside producers. This meant increased handling, and also other disadvantages. No doubt, it would be some advantage for retort-heating if one could have, as the author said, a gas of practically constant composition; but he (Mr. Bell) found that, if fair attention was given, the composition did not vary more than within moderate limits, and they had no difficulty in keeping their retorts at a uniform temperature. He took it that there would be no difficulty in shutting-off different beds. Perhaps Mr. Chaney would tell them how the labour cost would be affected, supposing it was necessary to shut-off half the beds and still work the producer. Then it seemed to him, there would be some additional cost in the handling of the coke. He had seen it stated that some of these producers were self-clinkering; and if the author had adopted this method, perhaps he would give members the benefit of his experience. But whether or not they thought it was to their advantage to introduce outside producers, one thing certain was that they must not allow people to come and buy their low-grade fuel (which possessed a great amount of calorific value) at the price it was formerly sold at. Each works should use its own, for steam raising, briquette fuel, or some other purpose. One of the advantages that the high price of coal had brought them was that it had become necessary for them to make the best of what they had.

Mr. W. C. Jones (Brierley Hill) considered the paper was of particular interest to those who made a lot of coke dust. He was in the fortunate, or unfortunate, position that he never now had enough dust made to utilize for steam raising. For years—in fact, as long as he could remember—they had raised all their steam with the refuse coke dust left in the yard and the ashes from the furnaces; but during the last two years, since they had adopted a method of quenching coke with a minimum supply of water—by stifling it in boxes—they had had practically no dust. It therefore became a very serious problem to him how he should raise steam; but happily the largest consumer of coke he had was tipping quantities of this very dust, which he had made in his breaking machine not far from the works. He (Mr. Jones) approached him, and told him he had a use to which he could perhaps put the dust; and he received a promise that it should be carted back to him. So that first he sold it to the consumer who then brought it back to him. [Laughter.] It was a question whether they ought to continue making as much dust from their coke as they had been in the habit of doing. From his experience of the last two years, he should say it was better not to get dust, but to make more good coke with very little moisture in it. This satisfied the consumers. The coke he had been referring to, which was stifled, had a good burning value in a domestic grate; and for any industrial purpose he was acquainted with, it was a better coke than that resulting from the ordinary method of quenching with a lot of water.

Mr. B. W. Smith (Walsall) remarked that he had had a lot of experience with breeze dust; and there was no doubt in his mind that Mr. Chaney had brought forward his paper for the benefit of those who were producers of this dust, which was a natural sequence to the use of machinery for conveying coke. In the handling of large quantities of coke over a distance, one was bound to make breeze, and breeze dust naturally followed. For many years he had been using nothing but breeze dust underneath the boilers, with forced draught. The only thing one had to attend to was to make proper provision for clearing out the base of the chimney. This was easily done with an extra damper and a pit. The dust would naturally go to the pit and accumulate. He had had no experience with outside producers; but he was afraid he must agree with Mr. Bell that they would involve a considerable amount of expenditure, and he did not think would attain quite all the author had set forth. There were so many factors operating at the present moment which, when pre-war conditions were reverted to, would alter the results now attainable. He was of opinion that anyone who had breeze dust could dispose of it to advantage without having recourse to an outside producer. He had had very big calls upon him for breeze dust in the past, and had had to refer people to Birmingham to get their supply. So that he had done a good thing for Birmingham, even if he had eventually punished himself.

Mr. Samuel Glover (St. Helens) said he also agreed that the subject Mr. Chaney had brought forward was a really live one. If it was only alive in the condition of a bantling, he thought it was a healthy one, and one deserving of the paternal care and attention which even healthy bantlings needed. That it was capable of being of great use in many works, he was quite convinced. There was one advantage that Mr. Chaney did not claim for the outside producer, and there was possibly one disadvantage; but he thought he had taken a very fair look at both sides of the balance-sheet. If they removed the producer from the retort-setting, they lost the advantage of the heat of initial combustion within the setting. This was a disadvantage the outside producer carried with it, along with those circumstances which the author had adduced. But the great advantage that the outside producer would give was the fact that it removed the duty of clinkering producers from the stoker or retort attendant. It was actually suggested that, in reducing the male labour in gas-works, they should introduce women for retort-house work. But whether or not they could do this at present was, he thought, a point beset with many difficulties, even though such a course might possess some advantages from the national point of view. However this might be, the quality of labour that they would be able to get for gas-works stoking in the future would, he was afraid, be very much more difficult to employ than in the past; and if they removed from the retort-house attendant the duty of clinkering the furnaces, they would have attained a great deal. At the present time it was the most arduous, the most stoker-like work of a retort-house. In many cases, it was the most difficult work to train the new stokers to; and it made the greatest demands on physical strength—and on common-sense, which was often hard to find in employees. So that Mr. Chaney would be quite honestly justified in adding this to his advantages. The fact that some of them managed to consume all their coke-yard refuse under the boilers was worthy of consideration; but, of course, it had to be remembered that they might not have to buy boilers quite so big if they were not providing them for burning low-class fuel. If, therefore, coke-yard refuse could be made better use of by being put into the ammonia-recovery producer, then, notwithstanding the fact that the temperature of the gas was reduced by the recovery process, the subject was one which called for careful attention of the gas industry. He hoped when matters like this were brought forward in the future they would look favourably upon them, and not be too ready to question their adaptability to circumstances that obtained in some gas-works, perhaps not necessarily even of the size of the works from which the proposal had first emanated.

The President said Mr. Bell had very gracefully voiced their appreciation of the fact that one of the Birmingham engineers had come forward with a paper. When Mr. Chaney was nominated Vice-President, he (Mr. Stevenson) told him that when he himself was first put on the Committee he was informed that the penalty was the reading of two papers; and this penalty he duly paid. Mr. Chaney immediately volunteered to contribute this paper. It was very pleasant to welcome him, and thus to renew their close association with Birmingham. This question of outside producers referred, of course, more particularly to the larger works. In 1905 it was very thoroughly threshed out by Mr. Alexander Wilson, of Glasgow, in a paper read before the Institution of Gas Engineers. Those who were in charge of smaller works were under entirely different circumstances; but there was just one matter he would like to mention. A neighbour of his, who was not a member of the Association, had been very badly hit during the past winter in the matter of labour; the chief difficulty being in connection with properly attending to the furnaces, which was the most arduous job on the whole works, and the job most generally scamped. His friend, therefore, had been looking out for a producer for doing away with coke firing; but he could not find one of sufficiently small size for his works. He was therefore proposing to use debenzolized gas for heating the retorts. It looked like giving a sovereign to gain a pound; but he considered that if the value of the coke saved was only one-fourth or one-fifth the cost of the gas, he would be amply justified by the reflex advantages. Coke was fetching an extraordinary price; and the cost of the gas in the holder would not be more than 4d. or 5d. per 1000 c.ft. The difficulty with all of them who were similarly situated would be to get producers of sufficiently small size; and many would not be adaptable for winter and summer loads, without very much loss in the summer time. This was another great point. Reckoning the matter on paper, and taking a value of 13,000 B.Th.U. per pound for coke, and gas at 4d. per 1000 c ft., it looked very bad; but, notwithstanding this, the extra quantity of gas secured by regular heating might very soon alter the whole complexion of things.

Mr. Chaney, in reply, said that he must admit there were several points on which the members had rather "cornered" him. In the first place, as to smallest size producer it would be possible to profitably instal for use on a gas-works, he would like to say that what he had endeavoured to do was to direct thought and attention to this matter of producer work. It might be very possible—and he believed it was probable—that the producer could be utilized for any small works. Of course, at many works the dust was got rid of by burning it under boilers. By all means let them do this; but they should extract the ammonia from the dust before burning it. Surely, if the value of ammonia at the present time was 7s. 2d. for every ton of dust that was burned, it was possible that it might pay to take out the ammonia, gasify the dust, and burn it in this condition. With regard to the calculation of working results, it was, of course, true that prices were abnormal now; but in his comparison he had taken abnormal prices throughout. If coke dust, producer coal, and sulphate of ammonia came down, they would all fall together *pro ratâ*. He was sorry he could not give them much information as to labour costs; but the figures he had showed that the sulphate of ammonia paid for all the labour in connection with the producer plant, and for the wear and tear expenses. The other profit that was made was the difference between the cost of the producer fuel and the price that was obtained for the displaced coke. It was a matter of regret to him that he could not help the President in the question he had put. It was a matter, he was afraid, that had hardly been threshed out yet. Personally, he did not think it was possible to have a very small producer working under the conditions that had been named; but one point in producer work was that in reducing the number of retorts there was no extra fuel expenditure. The amount of gas produced could be reduced by merely diminishing the blast. In shutting-down, the fuel expenditure would be automatically cut off.

Mr. Bell asked the author if he had had any experience with mechanically clinkered producers.

Mr. Chaney replied that mechanically clinkered producers were a matter he should not like to say much about just now, because of the German origin of the arrangement.

Mr. Bell pointed out that Mr. Wilson had a mechanical arrangement for carrying out clinkering which he knew had been in use for the last twenty years.

Mr. Chaney said he had in mind the Kerpely producer, which was one of the best rotating grates. Although they discharged the clinker well, and broke it up, it was always necessary, in his experience, to have a man on the producer to keep the fire in good moving condition. The discharge was no doubt automatic; but the difficulty was to keep the fire level, so that there was a proper travel of the blast through the fire, without making fire-holes in the top. Therefore, though the clinker might be automatically discharged, this was in a way offset by the fact that one still had to maintain the same amount of labour.

Mr. Otto K. Trechmann, for some years Chairman of the Hartlepool Gas and Water Company, who died recently, left estate of the gross value of £127,375.

NOTES ON GAS-WORKS PRACTICE UNDER WAR CONDITIONS.

By GEORGE B. JONES, Assistant Manager, Coventry Corporation Gas Department.

[A Paper read before the Midland Junior Gas Association, March 22.]

The greatest problem that has had to be faced since August, 1914, is the unprecedented demand for gas for industrial purposes. The output has increased from 1,156,420,000 c.ft. in 1914 to 1,565,620,000 c.ft. in 1916—an increase of 35 p.ct. Fig. 1 shows the growth of the department during the last few years.

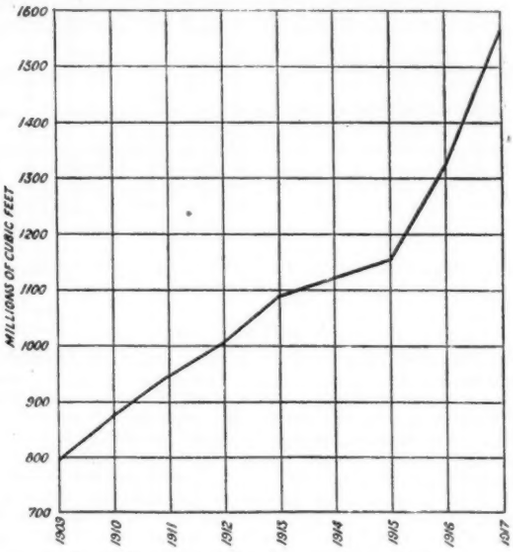

Fig. 1.—Diagram Showing the Annual Output of Gas.

The maximum daily output has correspondingly risen, as shown in Table A.

TABLE A.

Year.	Day.	Output in C.Ft.
1913	Dec. 23	4,452,000
1914	,, 23	4,796,000
1915	,, 23	5,177,000
1916	,, 19	6,928,000

DISTRIBUTION DEPARTMENT.

The distributing system and carbonizing plant have been strained to the utmost; but fortunately we have escaped accident, and there has been no curtailment of supply.

The Coventry area is divided into six districts. A trunk main under 20 inches booster pressure runs right through the city, and feeds each district. In one particular case, a temporary connection had to be made direct from the boosting main into the low-pressure mains to supply a district where the new demands of one consumer reduced the pressure from 25-10ths to 6-10ths. Table B shows the quarterly consumption of one industrial consumer.

TABLE B.—*Increased Gas Consumption of One Industrial Consumer.*

Quarter ending.	Gas Consumed.	Quarter ending.	Gas Consumed.
	C.Ft.		C.Ft.
Dec., 1913	573,200	Sept., 1915	3,749,400
Mar., 1914	609,000	Dec., 1915	5,425,800
June, 1914	502,000	Mar., 1916	8,714,800
Sept., 1914	500,000	June, 1916	18,682,700
Dec., 1914	1,000,000	Sept., 1916	36,746,600
Mar., 1915	2,110,900	Dec., 1916	35,917,500
June, 1915	2,821,800		

The pre-war and the present prices of fuels in Coventry are shown in Table C.; and the very favourable position of town gas has encouraged many manufacturers to instal gas-furnaces for operations which a few years ago were considered uneconomical with gaseous firing. At present, about 60 p.ct. of the output is used for industrial purposes.

For operations such as steel hardening and tempering, where absolute control of temperature is essential for successful working, gas has been long proved the best fuel, and many excellent standard furnaces are on the market. For core-drying, japanning ovens, &c., the reliability of gas enables it easily to hold first place among possible fuels. In both the above classes of operations the cost of fuel is of secondary importance compared with reliability and control; but for heavier furnace work—*e.g.*, annealing, billet heating, and metal melting—the fuel cost and furnace maintenance are of primary importance.

When a manufacturer proposes to use town gas for these

TABLE C.—*Increased Price of Fuel during the Last Three Years.*

Fuel.	Price in Feb., 1914.	Price in Feb., 1917.	Increase.
	£ s. d.	£ s. d.	P.ct.
Gas oil, per gallon	0 0 3½	0 0 10¼	192
Heavy fuel oil, per ton	3 12 6	8 17 2	144
D.S. steam nuts, per ton	0 12 6	1 4 0	92
Gas coke, per ton	0 14 6	1 1 6	48
Gas coal. ,,	0 15 9	1 1 10	38
Town gas, large quantities, per 1000 c.ft.	0 1 6	0 1 8	11
Town gas, small quantities, ,, ,,	0 2 2	0 2 4	7½

heavier operations, it is essential that each case should be considered separately in order to obtain the most economical results. In many instances there is no standard furnace on the market which suits exactly the conditions; and special plant, furnaces, and tackle have to be designed. There is a tendency for a manufacturer to try and utilize standard pattern furnaces; but there have been several failures which could be attributed to this cause, and where afterwards a specially designed installation has been highly successful. The time seems to be approaching when the principal use of town gas will be for industrial purposes; and gas undertakings will have to carefully consider their interests in this direction, for the right type of furnace means everything.

The large increase in demand naturally caused a varying pressure in the mains; and as it was impossible to put in larger mains or a high-pressure boosting system, some means had to be adopted for ensuring a constant reliable supply of gas in every works. After experimenting with high-pressure gas, air-blast, and air and gas mixture systems, it was decided to recommend all consumers to use a system of air-blast with gas under a moderately raised pressure. The cost of plant and the maintenance of furnaces was found to be excessive with high-pressure gas, if the early results were to be maintained with prolonged working. The air-blast system has the defect that the supply of gas depends on

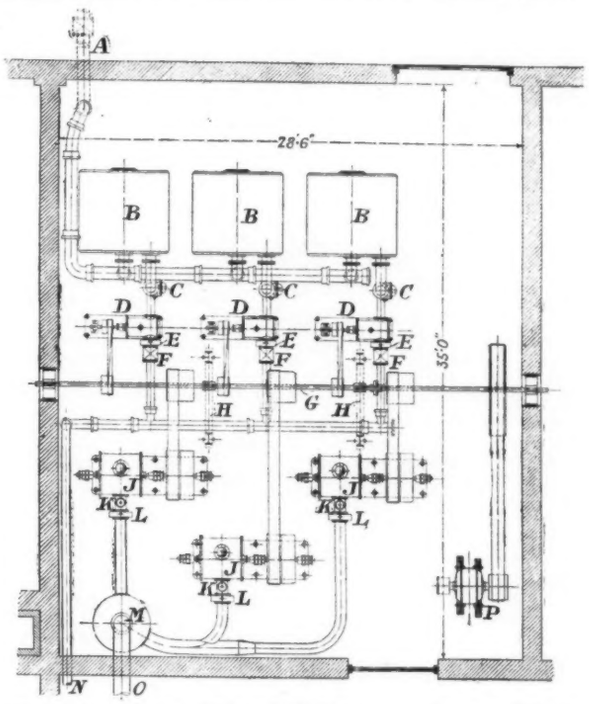

Fig. 2.—Arrangement of Gas and Air Compressors for an Installation to Melt 100 Tons of Brass per Week.

A 8 in. dia. Gas Inlet Main. B Gas-Meter, capacity 7500 c.ft. per hour. C Valve on Meter Outlet. D Rotary Gas Compressor and Governor, capacity 7500 c.ft. per hour, 10 in. water pressure. E Non-Return Valve. F Gas-Valve on Compressor Outlet. G Line of Shafting. H Steel Framed Supports for Shafting. J Rotary Positive Pressure Air-Blower, capacity 39,600 c.ft. per hr., 3 lbs. per sq. in. pressure. K Escape Valve. L Non-return Valve. M Air Receiver, 8 ft. 6 in. × 3 ft. 6 in. dia. N 6 in. dia. Gas-Main to Furnace-Room. O 12 in. dia. lead-covered 18 in. gauge Sheet-Iron Air-Blast Piping to Furnace-Room. P 40 H.P. Motor.

the fluctuating town pressure. With both high-pressure gas and ordinary air-blast systems, only one of the two elements producing the flame is under control—the other being drawn into the furnace. It is surprising how rapidly the efficiency falls off after constant use of the furnace, when the combustion space alters, nozzles choke or burn away, &c., and more attention is required than when both air and gas are under control. The most economical results have been obtained with an air-gas mixture system working at about 1 lb. per sq. in. pressure; but here, again, the cost of plant, special burners, and piping is high.

The system that has been adopted and installed at practically all the large works in Coventry is to pass all the gas entering the

works through a rotary compressor. These have a regulating valve to ensure delivery at an absolutely constant pressure up to the maximum capacity, and a full-way automatic bye-pass, so that gas can always be obtained at town pressure without running the machine. For low-temperature work, an outlet pressure of 4 in. water is arranged, so that ordinary standard atmospheric burners can be used. For high temperatures and special work, gas pressures up to 20 in. of water are used, and an air-blast up to 3 lbs. per sq. in. By this means the consumer is able to obtain an absolutely constant and sure supply of gas without alteration to existing pipes, burners, and furnaces. Fig. 2 shows the arrangement of one such installation divided into three units, which was put in during the last twelve months.

GAS-METERS.

There is confusion in the rating of gas-meters which meter manufacturers might avoid. Meters are rated by the number of lights that they will mythically supply. This misleading rating by lights is not even consistent with itself; for up to about 1000 lights one light equals 6 c.ft. per hour. But above 1000 lights one light equals only 5 c.ft. per hour. A far better practice would be to rate all meters over 600 c.ft. per hour, if not the smaller sizes, by the maximum cubic feet per hour they will pass.

A large number of meters have too few dials. In several instances where it has not been possible to arrange more than a quarterly inspection of dry meters, a complete revolution of the highest dial has taken place. All meters above 100-light should register up to 10 millions; for a 100-light meter passing 600 c.ft. per hour twenty hours a day, seven days a week, will pass over a million cubic feet in a quarter. Where the gas is used for certain industrial purposes, it is quite probable that the meter will work all day and night for weeks at a time.

TOWN GAS AS PETROL SUBSTITUTE.

A special use of gas for running in and testing petrol motors has rapidly developed since the petrol shortage. The economy effected by using town gas in place of petrol for this purpose has been appreciated by the local motor manufacturers; and the petrol saved has been of national importance. Town gas was introduced in Coventry in 1912 for the running in of petrol engines. During the last twelve months, Messrs. White and Poppe, of Coventry, have designed a coal-gas carburettor which is shown in fig. 3.

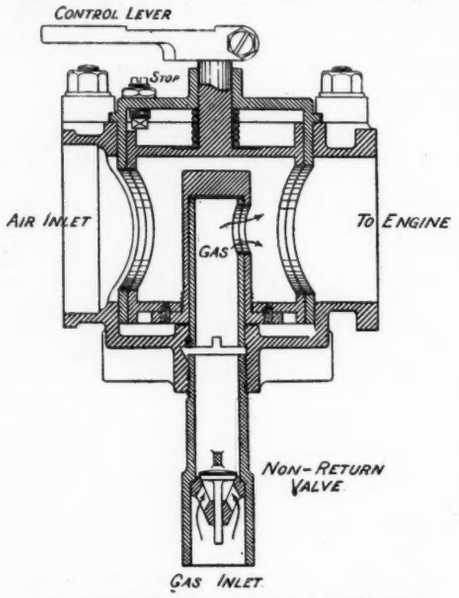

Fig. 3.—Coal-Gas Carburettor for Petrol Engines.

The gas and air ports and the throttle are formed in cylindrical sleeves, and are all worked from one control lever. The size of the ports and relative opening of each are carefully designed to suit the particular grade of gas used. Messrs. White and Poppe are using coal gas with this carburettor for running their engines under brake load on the bench, and use the curve shown in fig. 4 for converting the observed B.H.P. when using coal gas, into the corresponding B.H.P. for petrol. The curve was obtained from engines having a compression ratio of 3·95 to 1, and shows town gas to give about 85 p.ct. of the power of petrol.

The curve was obtained from over a hundred separate tests, although only three points are shown in the figure.

A comparison between the petrol and town gas consumption by the same engine running under similar conditions is as follows:

Petrol ·678 sp. gr.
19,500 B.Th.U. net per lb.
For good road work, the petrol used per B.H.P.-hour = 0·72 pint = 0·09 gallon. For average test on bench, the petrol used per B.H.P.-hour = 0·65 pint.

Town gas 485 B.Th.U. net per cubic foot.
Gas used per B.H.P.-hour = 24·5 c.ft.
∴ 1 gallon petrol = 250 c.ft. town gas.

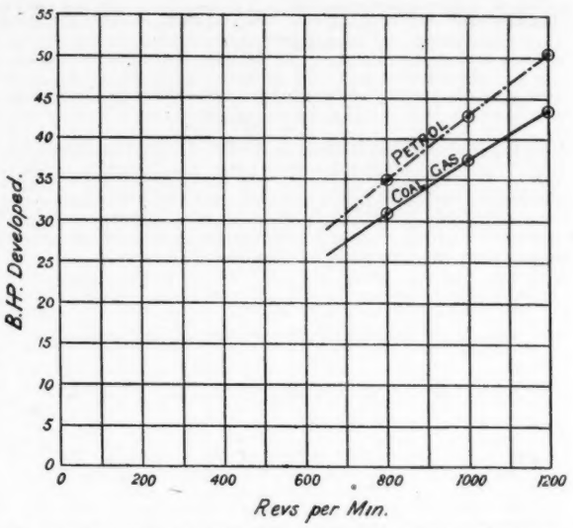

Fig. 4.—Comparison of the B.H.P. developed by a Petrol Engine on Petrol and Coal Gas.

WOMEN LABOUR.

The shortage of labour and the deterioration of available labour, form other problems that have to be dealt with by all gas undertakings at the present time. A few particulars of women labour on the works may be of interest. Towards the end of 1915, when the labour shortage became very acute, we imported from the Black Country about thirty women, who were used to coal and breeze washing, and, owing to the shortage of houses in Coventry, had to provide sleeping huts for them on the works. After a few months, local women augmented the supply; and, finally, we were able to obtain sufficient local labour and dispense with housing the women. The accommodation has since proved very useful for imported male labourers.

Table D shows a comparison between male labour and the skilled female labour from the Black Country, both working under similar conditions at washing coke breeze and loading into wagons.

TABLE D.

Number Working.	Weight of Breeze Washed and Loaded in Ten Hours.	Weight Washed per Person.	Rate per Hour.	Cost per Ton Washed.
	Tons.	Tons.	d.	d.
9 men . .	45·3	5·03	8·6	17·09
22 women .	67·5	3·06	6·09	19·84

Female labour washed 39·1 p.ct. less than male labour.
,, ,, cost 16·1 ,, more ,, ,, ,,

A further test taken with local female labour showed a slight falling off of efficiency. Female labour washed 43 p.ct. less than male labour, and cost 24·2 p.ct. more.

For forking, wheeling, and loading coke into wagons we have found boy labour to be much cheaper than women labour. Boys, however, require careful supervision, and lose much time. A comparison of man, woman, and boy labour for loading coke into wagons is shown in Table E. The women use a barrow weighing 67 lbs., and holding 65 lbs. of coke; while men use a 145 lb. barrow and carry a 140 lb. load.

TABLE E.—*Cost of Handling Coke with Various Classes o Labour.*

Class of Labour.	Tons Handled per Hour.	Rate per Hour.	Cost per Ton.
		d.	d.
Men	0·909	8·6	9·46
Strong boys . . .	0·647	6·6	10·20
Ordinary boys . . .	0·525	6·1	11·61
Women	0·350	6·09	17·40

Of the slot-meter collecting, 75 p.ct. is now done by women, who, together with those in the office, form 48 p.ct. of the present staff.

The available male labour has been very unsettled. From August, 1914, to March, 1916, with an average of 460 workmen on the wages books, 541 passed through them.

WORKS ITEMS.

The carbonizing plant has been pushed to the utmost. By decreasing the time of charging and increasing the heats, a very considerable increase in the make per mouthpiece per 24 hours was obtained. As was to be expected, the make per ton fell off slightly; and the settings were not improved by the over-heating. But by

careful regulation there has been very little loss of gas or damage to the settings.

Practically the whole coal supply has deteriorated during the last twelve months. The ash has in most cases doubled, the washing is very imperfectly done, and there has been a great increase in the chlorides present in the coal. This last has had a curious result. Owing to pit-sinking in the vicinity of the works at Foleshill, water is temporarily so short that the coke-quenching water and surface drainings have to be filtered and used over again. Before being employed in boilers this water is softened in the usual way by means of lime and soda; but the soluble chlorides are not removed, and these coming from the drainings of the coal stacks and breeze washing, gradually concentrate in the works' water supply and cause great trouble in the boilers.

Material used for repairs and maintenance has increased quite 100 p.ct. in price. Table F shows a few of the increased prices.

TABLE F.—*Increase in Price of Material since* 1914.

Material.	Increase in Price between 1914 and 1917.
	p.ct.
Mild steel	125
Wrought iron	95
Cast iron	35
Pitch pine	190
Red deal	170
Lubricating oil	100
Fire bricks	85
Shovels	115
Bolts and nuts	100
Portland cement	40
Belting	65

Strict economy in the use of materials is essential. It is surprising how easily lubricating oil can be saved by careful supervision and abolition of that great oil consumer the travelling oil can. Mechanical oiling, the use of grease in cups for all slow-running machinery and pump parts, the employment of graphite in steam cylinders in place of thick cylinder oil, and the collecting of all waste oil, are directions in which great saving can be made. Repairing broken castings with an oxy-acetylene welding apparatus is another means of effecting economy.

Most gas-works burn coke rubbish and cinders under their boilers. At the present time briquette making, with pitch and coke dust and pan-ash washing, should provide ample fuel for steam raising, and no marketable coke need be used under the boilers.

BENZOL EXTRACTION.

For some years all trouble with naphthalene has been effectively overcome by using "Solvene" in a Livesey washer placed between the ammonia scrubber and purifiers. When first starting to strip the coal gas of benzol and toluol, the Solvene carried forward was also extracted, and there was immediate trouble with the naphthalene. The stoppages numbered 75 to 100 per day, and in one case a 4-inch main was completely choked. Washing was suspended for awhile, and a paraffin vaporizer was installed. The paraffin is heated by dry steam coils, and a portion of the stripped gas is led through the vaporizer, which acts as a simple surface carburettor.

On re-starting benzol stripping, there was again naphthalene trouble. The stoppages reached a maximum of 120 per day about a fortnight after starting; but these rapidly diminished to 10 per day during the next fortnight. The stoppages occurred at first near the works, but gradually moved to the outlying districts as excess of paraffin was carried forward with the gas. After three months, traces of paraffin were found in the syphons at the furthest points of supply.

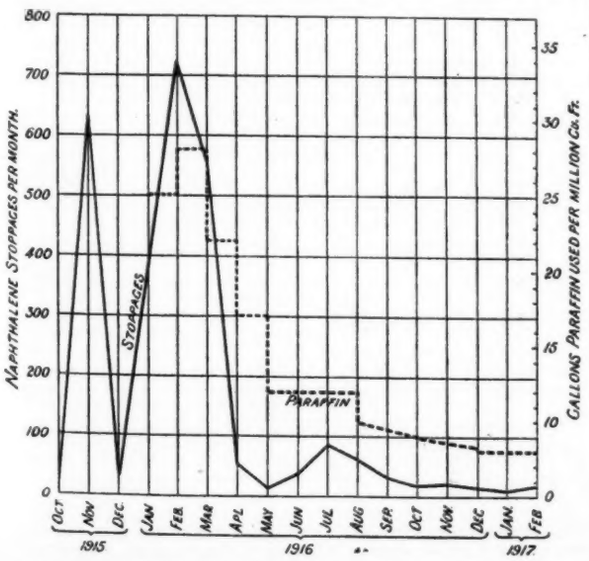

Fig. 5.—Naphthalene Stoppages and Quantity of Paraffin used when Benzol Stripping.

To start with, 25 gallons of paraffin per million cubic feet were used; but this was increased to 28 gallons for a short period. As the naphthalene disappeared, the amount of paraffin was gradually reduced until 6 gallons per million c.ft. was reached. This small quantity has been used for the past three months; and there have been not more than twenty stoppages per month. Fig. 5 clearly shows the number of stoppages, and the quantity of paraffin used. The stripping has been fairly complete, averaging about 85 p.ct.

The greater part of the paraffin is thrown down in the syphons near the works and in the holder; and an examination of the oil deposited shows it contains about 15 p.ct. of naphthalene.

There was difficulty in evaporating the neat paraffin; and for larger quantities of paraffin than 17 gallons per million, one part of paraffin was mixed with two parts of special enriching spirit. For less than 17 gallons per million, one part of paraffin to one part of spirit was used.

Table G shows the approximate fractionation of the paraffin spirit and 50 p.ct. mixture.

TABLE G.

Paraffin.	Enriching Spirit.	50 P.Ct. Mixture.
Sp. gr. ·815 to ·817	Sp. gr. ·740 to ·760	10 p.ct. at 90° C.
35 to 40 p.ct. at 200°C.	10 to 15 p.ct. at 80°C.	30 ,, 100° ,,
60 to 70 ,, 250°C.	70 to 80 ,, 90°C.	50 ,, 120° ,,
90 to 95 ,, 300°C.	80 to 90 ,, 100°C.	55 ,, 140° ,,
	dry at 110° to 130°C.	65 ,, 160° ,,
		68 ,, 180° ,,
		75 ,, 200° ,,
		90 ,, 250° ,,
		95 ,, 280° ,,

The oil-washer takes out a considerable quantity of carbon bisulphide; an average being as follows:

Sulphur compounds at inlet of oil washer	46·3 grs.	100 c.ft.
,, ,, outlet ,,	34·0 ,,	,,
,, ,, extracted	12·3 ,,	,,
	= 26·5 p.ct.	

The average effects on the quality of the gas with an extraction of 1¾ gallons of unwashed products per ton coal is:

Reduction of net calorific value	6·7 p.ct.
,, of illuminating power	37 ,,

The question of continuing benzol-washing after the war depends largely on the probable market price of the benzol and the steam consumption of the stills and rectifying plant. Gas-works crude benzol contains more higher boiling-point constituents than coke-oven crude benzol. The latter is usually washed before fractionation, and consequently, as most gas-works rectify without washing, gas-works benzol requires more steam for its production than coke-oven benzol. Some benzol plants are high steam consumers; and a reliable report on the steam used per gallon of benzol produced by the various types of plant at present in operation in gas-works would prove useful when deciding the question of benzol washing as a commercial proposition after the war.

RESIDUALS.

Finally, I wish to draw attention to the ever-increasing importance of residuals in coal-gas manufacture. Table H shows how the cost of manufacture of carburetted water gas has increased since 1914; and Table K shows how the cost of coal gas has increased.

These figures are not put forward as ideal ones, or as actual results obtained; but they are comparative, and show how the increased revenue from residuals has very nearly balanced the

TABLE H.—*Cost of Making Carburetted Water Gas.*

—	Cost: Pence per 1000 C.Ft.			
	1914.		1917.	
	Rate.		Rate.	
Oil, 1·9 gallons	(3½)	6·65	(10½)	19·47
Coke, 60,000 c.ft. gas per ton	(14/6)	2·90	(21/6)	4·30
Boiler fuel	5/-	0·50	10/-	1·00
Wages	..	0·88	..	1·16
Water	..	0·05	..	0·06
Purifying	..	0·05	..	0·10
Repairs and maintenance	..	1·44	..	1·92
Total		12·47		28·01
Less residuals		0·40		0·30
Net cost into holders		12·07		27·71
Increase		..		15·64 = 129 p.ct.

TABLE K.—*Cost of Making Coal Gas.*

—	Cost: Pence per 1000 C.Ft.			
	1914.		1917.	
	Rate.		Rate.	
Coal, 12,000 c.ft. per ton	15/9	15·75	21/10	21·83
Coal handling	..	0·29	..	0·36
Repairs and maintenance	..	1·04	..	1·39
Coke for settings, 10 p.ct.	14/6	1·46	21/6	2·15
Boiler fuel	5/-	0·14	10/-	0·28
Wages carbonizing	..	1·01	..	1·35
Electrical power	..	0·06	..	0·07
Purifying	..	0·64	..	0·70
Solvene	10½	0·21	..	..
Paraffin	..	..	11½	0·07
		20·60		28 30
Less residuals		8·88		13·57
Net cost into holders		11·72		14·73
Increase		..		3·01 = 25 p.ct.

increased cost of coal. The greater cost of carburetted water gas as compared with coal gas at present prices is also shown. Except where long favourable oil contracts are running, I expect returns would show that the greater percentage of carburetted water gas used, the greater has been the advance in the price of gas since 1914. At Coventry, we are fortunate in making nearly straight coal gas, and have only had to increase the price 2d. per 1000 c.ft. and have maintained former profits.

It is amazing how even to-day some gas-works still treat their residuals by rule-of-thumb methods. At Coventry, the chemical works are above the capacity of the home-made residuals, and gas liquor is bought from other works. Several gas undertakings still insist on clinging to the absurd method of selling ammonia liquor on a basis of Twaddel strength by hydrometer. Ammonia is the chemical bought and sold; and a proper distillation test of the ammonia should be the only basis of liquor contracts.

Table L shows liquors from four Midland gas-works compared. The antiquated Twaddel strength varies considerably from the true strength by distillation. The Twaddel test is more a guide to the percentage of carbonic acid gas in the liquor than of the percentage of ammonia.

TABLE L.—*Comparison of Gas Liquors.*

Works.	Twaddel at 60° Fahr.	Ounce Strength from Twaddel.	Ounce Strength by Distillation with Sodium Hydrate.	Percentage Error of Twaddel Strength from True Strength.	Percentage Free Ammonia.	Percentage CO_2.	Percentage H_2S
A	6·0	12·00	16·33	−26·5	65·6	4·89	·43
B	3·5	7·00	9·52	−26·4	74·4	2·81	·48
C	6·7	13·40	13·13	+ 2·0	68·8	6·13	·28
D	5·1	10·20	8·92	+14·3	60·5	4·33	·18

Samples of spent oxide from many gas-works have been examined with a view to buying for the sulphuric acid plant; and here, again, it is amazing how high the ammonia is in some samples from the smaller works. More than one batch of oxide would have paid to buy for the ammonia it contained. This ammonia is not only a loss to the seller, but a loss in another way to the buyer as well, for the ammonia uses up the nitre required in acid manufacture. Some of this ammonia is no doubt put into the oxide intentionally, to neutralize any acidity or souring; but this seems to me a most uneconomical method, when cheap lime, properly prepared, can be used just as effectively.

The so-called residuals from the carbonization of coal for gas are yearly assuming a place of more and more importance. We have certainly learnt one lesson since 1914, and that is to protect and develop to the utmost our natural resources. Is not coal, especially bituminous coal, our greatest national asset? A very large proportion of the coal raised is placed in our hands; and we must extract the very last farthing's worth of products.

It is often said that gas-works should make gas, and coking plants coke; but it seems to me that the present idea of the gas engineer and the coking engineer will pass away, and be replaced by the coal distiller, who will carbonize the coal and prepare the products for the market. Of late years "make per ton" has become rather a fetish in the gas industry, and the development of bye-products rather left in the background. We should be quite as keen to obtain the highest yield of ammonia, and to put the purest and whitest sulphate on the market, as we are to obtain the highest make of pure gas—in fact we should be keener to supply residuals of the highest quality; for these have to compete in the world's markets, whereas the gas does not have to meet competition.

Coal is our only large source of fixed nitrogen; and yet we are content to lose 80 p.ct. in carbonizing, and at the same time have to import annually thousands of tons of nitre. The Sulphate of Ammonia Association have done much for the sulphate industry, but what of other ammonia products—*e.g.*, ammonium chloride, ammonium carbonate, pure ammonia, and the oxidation of ammonia to nitric acid? After the war sulphate of ammonia is very likely to be seriously affected by the ever-increasing production of fixed atmospheric nitrogen—cyanamide. Germany must have advanced considerably lately in fixing atmospheric nitrogen and oxidizing ammonia to nitric acid; for she has no large natural water power, and must have fixed nitrogen for the production of explosives.

The manufacture of sulphuric acid from spent oxide has been taken up very sparingly by the gas industry. Sulphuric acid may well be called "the life blood of the chemical industry" at the present time; and I can assure you that the sulphuric acid plant at Coventry has been a blessing during the shortage of acid, and an excellent source of revenue.

Coal carbonizers cannot help making such products as ammonia, sulphur, benzol, and tar, with its wonderful derivatives. It is of primary importance that gas undertakings should obtain the best possible financial results from their bye-products, and of national importance that the greatest quantity of the products should be obtained. We lost the aniline dye industry; are we to lose the fixed nitrogen industry also? Chemical manufacturers have been rather slow at development in the past; and it seems to me that the gas industry, by organization, by co-operation, and by internal development, should protect its own interests, and see that its residuals are produced and utilized to the fullest extent.

Gas undertakings have a unique advantage over private chemical manufacturers in having no competition among themselves. The supply of town gas must of necessity be a monopoly in each area. There should be no insurmountable difficulties in arranging much closer co-operation and interchange of views between one gas undertaking and another. There is an analogy to competition among gas undertakings, which lies in the professional reputation of the management; but surely this should not prevent a frank exchange of ideas. Problems connected with the choice of various types of plant, the yields and working-up of bye-products, and obtaining and holding suitable markets, could much better be solved by a permanent joint staff for a particular area. Also, co-operation should not be confined to one particular representative of an undertaking, but should be encouraged and arranged to take place between the keen, but less responsible members of the staff, as part of their ordinary duty. Many a junior has ideas which cannot be tried at the particular works at which he happens to be engaged, but which could often easily be experimented with at a suitable neighbouring works.

DISCUSSION.

Mr. F. J. Ward (Knowle), in proposing a vote of thanks to Mr. Jones for his exhaustive and interesting paper, said one of the things that had struck him was the enormous increase in the sales of gas at Coventry, especially during the last two years. Coventry, of course, was exceptionally well situated for these increased sales, and in this respect was vastly different from some other undertakings. In the particular case in which he (the speaker) was interested, there had been a decrease of 20 p ct., instead of an increase of 35 p.ct.; and they had had to face this along with increased costs. He did not know how Coventry would have come out in these circumstances. Mr. Jones said that coal gas had cost 25 p ct. more; and this, with a decrease of 20 p ct., had made him look round very closely to see where costs could be reduced. It had been necessary to increase the price of gas; but, notwithstanding this, it had been impossible to get the results attained before. Mr. Jones said at Coventry they were trying to produce as much gas as they could in the retort-house; but he took it they were simply doing this because they were compelled to, as later in the paper they were urged to consider the residuals. Probably at Coventry this was not being done now; and that, he thought, was the case with most gas undertakings. They were simply trying to get as much gas as possible out of the coal. The comparison of cost as between male and female labour was interesting. Of course, women were not equal to men in the amount of hard work they could perform; but, at the same time, they also knew that men were not equal to women in the particular work women could perform. No doubt, Mr. Jones would admit that the women had been of great advantage to Coventry. Possibly if they had not been there the undertaking would not have got out of its difficulties as it had done. Were women, he asked, still engaged there?

Mr. Jones: Yes, in greater numbers.

Mr. Ward: Do I understand you are still supplying gas in the particular area referred to where the pressure was reduced to 6-10ths?

Mr. Jones: We have had to make a connection direct into the boosting main.

Mr. R. G. Marsh (Birmingham) referring to fig. 2, representing a private compressing plant for both gas and air, asked the author whether he found any excessive oscillation of gas pressure in the mains from the working of the rotary compressors, which were fixed so close to the three meters that supplied them. Further, he noticed that the three meters were supplied by one 8-in. service; and when all three compressors were working, as he presumed would be the case under some conditions, the total amount of gas being consumed would be over 20,000 c.ft. per hour. This might be the position in which it was stated that the pressure in the mains was reduced to 6-10ths. If so, it answered his question. It seemed to him that such a heavy consumption from the 8-in. service would very seriously reduce the pressure in the street-mains. Had the author any observations of the pressures that existed under full working conditions, and with only one or two compressors running? He noticed that a back-pressure valve was provided on the outlets of the three compressors. Of course, it was highly important that these valves should be absolutely sound, to prevent gas from the high-pressure side leaking back through the

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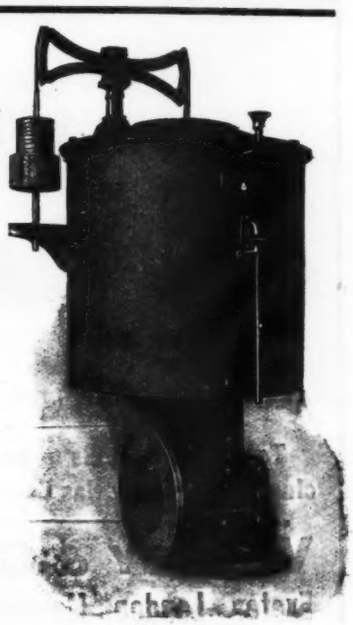

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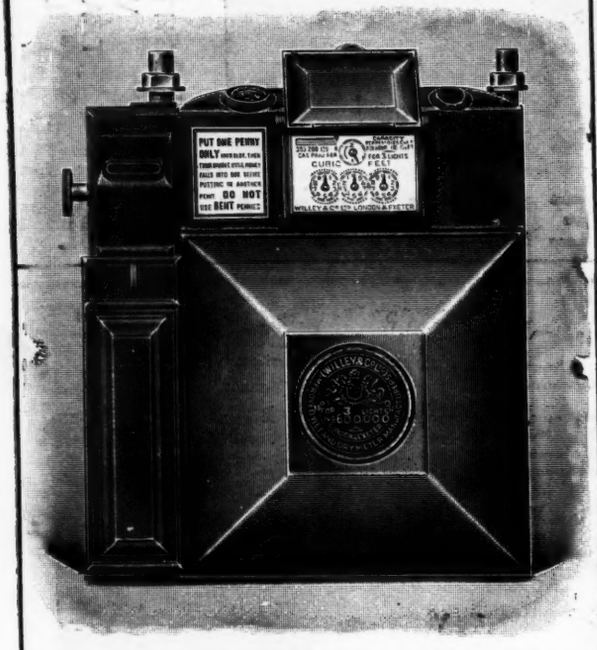

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compressor into the meter was not in use. A triple plant was provided for; one reason being that, in case of breakdown, work could be continued with part of the plant. But only one electric motor had been provided to do the work for the three machines. Was it not well within the bounds of possibility that the breakdown might be on the electric side, in which case the whole of the plant would be thrown out of action? He would have thought that, in going to the expense of providing apparatus in triplicate, three motors might have been installed, as well as three compressors. With regard to the rated capacity of gas-meters, the present method might be rather absurd; but it was one thing they were all thoroughly well used to. Perhaps in the future it might be an advantage to have a meter rated by its absolute capacity. When high-pressure meters were first used in Birmingham, they did endeavour to introduce a more uniform method of rating them. For instance, they called a meter that would pass 1000 c.ft. an hour size 100, and one that would pass 100 c.ft. an hour size 10—allowing 10 c.ft. an hour for each unit of size. Meters were mentioned in the paper as having too few dials, where it had not been possible to arrange for more than a quarterly inspection. Were these wet or dry meters? They had found it advisable in Birmingham, where meters under present war conditions were passing a very large quantity of gas, that they should have much more frequent inspection than once a quarter, merely to ensure that the water-line was kept at a proper level. In some cases there were weekly inspections for this purpose, and in others fortnightly; and, of course, it became easy in this way to get frequent readings, and so avoid the possibility of missing a revolution. As to the adoption of the carburettor for town gas, he might mention that town gas was many years ago used in Birmingham for the purpose of running-in petrol motors and testing them; and they designed a carburettor—or, more properly speaking, a gas and air mixer—of much simpler form than the one shown in fig. 3. Independent regulation of both gas and air was possible.

The PRESIDENT (Mr. G. C. Pearson, Birmingham) remarked that the author had brought forward a number of points on matters of great interest; and it was specially gratifying to see the way in which Coventry had been able to get through the time of stress which they had all experienced during the past two years. Coventry, of course, was a very big munition centre; and it was a fortunate thing that they should have been able to supply the largely increased demand for gas. He presumed, from the author's remarks, that this had been done without having to resort to an undue quantity of carburetted water gas, which, as the figures in the paper showed, had risen so largely in cost. As a matter of fact, making up an extra output of gas by means of carburetted water gas was ruinous just now; the price of oil having more than trebled. This was why the gas fire load in Birmingham was felt more than any other load they had to meet. A real wintry day [like the one on which the meeting was held] meant an increase in the Birmingham output of 3 million cubic feet. Any load that was constant they did not, of course, have much trouble with. Mr. Jones spoke of the use of town gas in the future being chiefly for industrial purposes. No doubt this would come to pass; and the war had helped them to a very great extent in teaching consumers the value of town gas for these uses. It had been necessary in many ways for the making of munitions; and the existing conditions had also been useful in showing the possibilities of lower grades of gas than had been made in the past. He believed that, as time went on, they would find it as possible to attain desired temperatures in furnaces with still lower grade gas and lower pressures than had ever been thought possible in the past. Then there was no doubt they would get the best value from their store of energy. As to pushing the carbonizing plant, reference was made to speeding-up three days, and then working three days on ordinary lines. Was this method better—in working three shifts a day—than speeding-up one and slacking-off one? It seemed that in the latter mode of procedure more even results should certainly be obtained. In the matter of economy with oil, Mr. Jones had touched a very important point. There was in some works a tremendous amount of waste taking place in oil and oiling. There were oil firms willing to take a contract with large works on the basis of the saving in oil they could bring about. These people were experts in the usage of oil; and they would introduce certain pumps and methods of oiling which would save a considerable quantity. It was impossible to emphasize too much the portion of the paper which drew attention to the importance of residuals. That was to say, the importance of considering the results as a balance-sheet—not as gas only, but as gas and residuals, taken together. With regard to women labour, there was a certain screening plant at the Windsor Street works that used to be worked before the war by sixteen men. These sixteen men had now been replaced by nineteen women, who did the same amount of work as the men formerly accomplished. The cost was roughly speaking 7½ p.ct. more, which was a little better than Mr. Jones's figures. Taking the whole of the coke-screening operations, women were more expensive than men, because when it came to wheeling barrows, forking, and shovelling, they could not compete with male labour; but it must be remembered that they had stepped in to keep things going. A gas-works was not a woman's place; and they should be really grateful to them for coming forward to help at such a time.

Mr. JONES, in reply, said that Coventry was, of course, in a very exceptional position in the matter of munition works. It had been necessary to look after them first. The increased make per retort had, as explained, been secured by speeding-up. They had not been able to look after the residuals any more than other people; the main object in view had been to save the holders from grounding. This they tried to do as much as possible with coal gas. Carburetted water gas was not used any more than could be helped. Of course, they all appreciated what women had done. As to the oscillation in the mains. In many cases where these compressors had been fitted they had had to put in an anti-fluctuating valve; but with the large installation which was particularly referred to in the paper it was not necessary, because of the special circumstances relating to the connection with the main. In reply to the questions regarding fig. 2, they had a very good pressure in the 8-in. gas inlet main. This was not the case where the new demands of a consumer reduced the pressure from 25-10ths to 6-10ths. They had arranged the governor pressure so as to get all the gas through; and as it only supplied this particular consumer, he was able to pull with his compressors and get all the gas that was required. The back-pressure valves were only fitted in case the belt broke, or the compressor stopped accidentally. There was not much danger of the pressure going back. The outlet pressure of these compressors was only 10 inches; and he did not think that it would do a very great deal of harm if it did go back. There had not been a breakdown of the electric motor; but this was just the section of the plant over which they did not get control. The ordering of the motor and the fixing of it were undertaken by the firm for whom the plant was laid down; and, of course, these people had to take the risk. He did think the present method of rating gas-meters was an absurd one; and as to being used to it, that was an argument which had been employed on many occasions. For ordinary consumers' meters, it was quite familiar; but he was referring particularly to large installations, where one might get up to a consumption of 20,000 c.ft. an hour. In regard to inspection, the meters to which he had referred were dry ones. Of course, all their wet meters were inspected more often than once a quarter; but for everything up to 600 lights they had dry meters in Coventry. When they knew that there was a meter working very hard, they arranged for another inspection. For speeding-up, they had not tried the plan of running one shift speeded-up and one normal. They were getting over the stress a little now, as the consumption was dropping.

The PRESIDENT added that they found it an advantage at Windsor Street, now that the number of women on the works was increasing (there were somewhere about eighty at the present time), to appoint a woman to take charge, in a similar manner to the welfare women in charge of female workers in the national shell factories. It was a proper thing that complaints by women should be made to women; and it was best, as far as possible, to give all orders through a woman to the women.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Fuel Economy.

SIR,—Your article in last week's "JOURNAL," under the title "Relation of Calorific Power of Gas to Fuel Economy," is one which I hope will be widely read, and carefully pondered over; for the suggestions made are important in the interests of good and economical gas supply under the new conditions brought about by the adoption of a calorific standard and the need for a larger production of benzol.

There is a better way than the simple expedients adopted in a number of works for swelling the apparent volume of gas from a given weight of coal; and it is a way which will avoid the presence of a high percentage of inert gases.

The better way is to make, under the best conditions, blue water gas. Those who are sufficiently interested may possibly find some helpful suggestions in the address I gave to the Southern Association in March, 1914, and reported in the Technical Press. [See "JOURNAL" for March 17, 1914, or "Reports of Gas Associations" for the same year.]

Conditions as to supply have altered since that date. I there suggested the use of 18 p.ct. of blue gas. It is now possible to use 25 p.ct. and at the same time obtain a satisfactory yield of benzol from the coal gas, and comply with the new standard of testing.

Instead of (say) 13,000 c.ft. of gas per ton of coal obtained at the expense of excessive wear and tear, excessive naphthalene, excessive sulphur compounds, and other drawbacks, coke gasified under correct conditions will give 60,000 c.ft. per ton, and cost, with coke at (say) 28s. per ton, not more than 8d. per 1000 c.ft. The gas has a high flame-temperature, and is nearly all combustible.

Coal gas at the present time must be costing in many works not less than 1s. 6d. per 1000 c.ft. It is therefore a simple calculation to ascertain which is the better business proposition. I claim that the moderate make of honest coal gas, the production of benzol, and the addition of 20 to 25 p.ct. of blue water gas is worth the earnest consideration and approval of those responsible for the economical supply of gas for all purposes, and that those works possessing water-gas-plants should, in the national interest, use them.

THOS. GLOVER.

Norwich, March 24, 1917.

Government Prices for Benzol, Toluol, and Phenol.

SIR,—I ask for the hospitality of your columns to insert a copy of a letter I have sent to the Secretary of the National Gas Council, calling upon them to investigate the prices paid by the Government for benzol, toluol, and phenol, and asking them to apply for a substantial increase in these fixed prices.

May I ask all managers of gas undertakings who agree with this request to also write to the Secretary of the National Gas Council, supporting my suggestions.

F. LIVESEY,
Engineer and General Manager.

Maidstone Gas Company,
March 19, 1917.

[ENCLOSURE.]

Maidstone Gas Company, March 19, 1917.

The Secretary, National Gas Council,
39, Victoria Street, S.W.

Dear Sir,—I write to call the attention of the National Gas Council to the inadequate prices now being paid to gas companies for crude benzol, light oils, and naphthas.

The Government have during the war fixed prices for many different commodities; but they have generally, in doing so, taken somewhat as a guide the laws of supply and demand. In the case of freights,

which are under Government control, an advance of nearly 400 p.ct. has been allowed.

All this time the prices of benzol and toluol have remained nearly stationary; and I think that now is the time to ask for a substantial increase. Supposing the war had not created a special demand for benzol, many medium-sized gas undertakings would now be marketing motor spirit at 2s. 6d. per gallon. The farmers demanded more money for their potatoes, and got it; and, in addition, were promised sulphate at cheap rates when the price of acid is considered.

It appears that all well-organized trades can obtain what they ask for in reason, but that the gas industry, through being unwilling to take its own part, is made to suffer.

Is there any reason why the demand for benzol should not have forced up the price by 300 p.ct., in common with other goods?

The fact that pitch is a drug on the market should really have had a tendency to force the price of benzol still higher.

The cases of many small gas companies are extremely hard—viz: The tar of one small company, although rich in toluene and benzene, does not command a price sufficient to pay for the carriage to the station. The result is that the best way to dispose of it is to pour it on to waste land. Another case: The company spent (for them) a considerable sum on the installation of the "C" process. The results are excellent, yet the price of the tar will not pay for the carriage to a distiller. What is wrong? To my mind the price of benzol; and I believe many will agree with me.

Many gas companies have now an obligation to supply gas of a calorific power of 500 B.Th.U. gross. Now, as Mr. Herring very clearly explained in his letter to the "Gas World" of March 3, the cost to gas companies of extracting benzol is about 1s. 3d. per two gallons. I think Mr. Herring is too modest in his estimate. If gas is sold at 3s. 6d.—a more common price now than 2s. 6d.—a 5 p.ct. reduction in calorific value is worth 2·1d.; and assuming a make of 12,000 c.ft. per ton, this gives the value of two gallons of benzol at 25·2d. And, in addition to this, the capital and heavy repair charges make the cost considerably more than 9d. per gallon—the price we receive.

A clear case then exists for the application to the High Explosives Department of the Ministry of Munitions for a substantial increase in the price of benzol, toluol, phenol, and other products, as will enable oil-washing at medium-sized works to be carried on at a profit, and will enable small gas companies to sell their tar to distillers and make for it at least 2d. per gallon net.

I am sending a copy of this letter to the "GAS JOURNAL" in the hope that those managers of gas undertakings who agree with me will also write to the Secretary of the National Gas Council supporting the proposed application to the Explosives Department.—Yours faithfully,

(Signed) F. LIVESEY.

The Revision of the Sliding-Scale.

SIR,—It gave me much satisfaction to find in your last issue that a gentleman of wide experience in these matters had decided to raise the question of the working of the sliding scale under the altered conditions which have arisen since the outbreak of the war. No one who has much to do with the accounts of gas companies is likely to question the wisdom of a consideration of this matter.

I am, however, somewhat doubtful as to whether Mr. Paddon's proposal would be sufficient, in all cases, to do substantial justice to shareholders in gas companies. There are many undertakings where the standard price was fixed years ago, and where, owing to the gradual reduction in the price at which gas was sold, the dividend had been very materially increased above the standard rate. In not a few cases, the bulk of the capital has been bought to give what, at the time of purchase, was the ordinary rate of return on money invested—the price paid for the shares being calculated, not on the standard rate of dividend, but on the dividend paid at the time.

At the present moment the market rate of return on capital invested has very largely increased; but, owing to the general rise in prices, the rate of return to shareholders in gas companies has not only not increased, but has very materially diminished. This is a matter of serious importance to many people of limited incomes, who have invested in gas companies because of their reputation for security and freedom from fluctuating dividends.

It is, of course, possible to argue that, if anyone makes an unfortunate investment, he must abide by the result. The position, however, in regard to gas companies is complicated by the fact that this loss is directly due to restrictions imposed by Statute, and is likely to react very seriously on the cost of future capital.

When economic conditions change, the factors of production—the cost of labour, material, and capital—adjust themselves when not interfered with by legislation. The rise in the cost of material and labour, and in the return expected from capital, is in such cases met by a rise in the price of the commodity manufactured. With a gas company, the cost of materials and labour must be, and is, compensated for by a rise in the price of gas; but by the action of the sliding-scale the return on capital is automatically reduced, although capital, like other commodities, has risen in value.

If we consider the way in which a standard price is fixed, and the object for which it was introduced, the arguments for a general reconsideration are reinforced. The standard price was, admittedly, instituted in order to give gas companies an inducement to conduct their affairs as economically as possible, and sell gas at the lowest possible price. It is fixed in relation to what is considered to be the probable normal cost of labour, raw material, and capital, and so as to cover the probable fluctuations in the various factors without interfering with the general fair working of the arrangement. Therefore, where we have a complete change of the economic conditions upon which the factors are based, and consequently a totally unforeseen and abnormal alteration in the prices of materials, cost of manufacture, and capital, it seems to be only fair that the standard price should be adjusted to fit the new conditions.

Had the war lasted a short time only, or even were it likely that the economic conditions would return to the normal soon after the war is finished, many people would be inclined to say that this was a war loss, and we must put up with it for the time being. But what prospect is there that pre-war prices and conditions will be re-established, even approximately, for many years, or perhaps within the lifetime of the present generation?

ARTHUR VALON.

5, *Victoria Street, S.W., March* 22, 1917.

SIR,—Surely it is time the question of the suggested temporary suspension or revision of the sliding-scale principle as applied to gas companies was taken up in a serious form. The leading article in the "JOURNAL" of the 20th inst. (while not going as far as one would like) gives expression to opinions which many of us have entertained for a long time.

To many companies it is not merely a question of the "preservation of the standard rate of dividend," but a matter of making up, if possible, the difference between pre-war rates and present rates of dividends (which may not have reached the standard), in which they feel that the operation of the sliding-scale under war conditions is harsh. To this extent, one goes further than you and Mr. Paddon. The question is complicated, and would not be so difficult of approach were all existing holders of gas stock original proprietors. As it is, the bulk of gas stock in sliding-scale companies has probably been acquired at prices which were affected by conversions and consolidations, and even the factor of premiums.

The largest undertakings are in a better position than others to meet the present difficulties, and do not either now or in the future feel the need of amendment as much as the smaller concerns. Take the case of undertakings dependent wholly or in large part on water-borne coal. Not only have they had to bear the higher cost of coal at the pit-mouth, but they have been up-against monstrous rates for freight, from which there has been no escape—not being the fortunate possessors of their own ships. The figures given by the chairmen of the big London companies during the last two years, as to the cost of running their own boats compared with rates ruling in the open market, amply illustrate this point.

If there were any reason to believe that the present difficulties of gas companies were of a purely transitory and temporary character, there might be some justification for a waiting policy. But all the signs and portents point to a permanent raising of prices. The old policy of Free Trade (call it what you will) made for cheapness in many commodities indispensable to a gas undertaking. On the subject of our economic policy before the war, there was much talking "about it and about;" yet for all that the system seemed unlikely to be moved. The war has changed all this. Everyone now demands that some modification—this may prove too mild a word—is inevitable. Many Labour M.P.'s (all quondam Freetraders) have avowed their conversion to fiscal reform.

Politics apart, it must be admitted that the introduction of a system of tariffs will lead to a rise in the prices of commodities generally. This will be met by a demand for increased wages. This demand will be met—indeed, it was promised before the war—by tariff reformers. All this means that gas companies, in common with other industries, will be faced by a permanent increase in the cost of production. Other industries will do the obvious thing, and ensure their usual profit by an increase in the price of their finished article. Assuming that present conditions were normal, gas companies could not do this without their shareholders suffering.

Mr. H. E. Jones, speaking at the last meeting of the Gas Companies Protection Association, said: "Directly the situation changed materially—when, for instance, wages, coal, and money were permanently different—then they would have a general case upon which the Committee might go before Parliament." If Mr. Jones thinks that time is not yet, some attempt should surely be made to tide-over the present injustice. If conditions are still considered too unstable to attempt a revision, why not move, as a temporary measure of relief, to enable gas companies to pay dividends based (say) on an average of three years prior to the outbreak of war? This, of course, would be, as you say of Mr. Paddon's suggestion, for a stated period after the war—until such time as it was thought the subject could be viewed from a more normal position.

Gas shareholders are suffering from the effects of a principle, admirable and stimulating in peace time, but which, when devised and by whom, never contemplated such a commercial and economic upheaval as that with which we are face to face, and that from causes not innate in ordinary times of trading.

F. A. GULLAND,
Secretary and Accountant.

Maidstone Gas Company, March 23, 1917.

SIR,—I was much interested in the leading article on this subject in the last issue of the "JOURNAL," as also in Mr. A. M. Paddon's communication in the same issue. I am firmly convinced that relief should be sought from the authorities, either by a suspension of the sliding-scale, or by a modification thereof.

I agree with you that precious time has been wasted. In January, 1916, I wrote to the Gas Companies' Protection Association on the matter, and again in January this year. But so far they have not done anything to seek relief, and which inaction, I venture to suggest, they may hereafter regret.

Individual procedure would be unnecessarily costly, and possibly useless, whereas joint application has a reasonable chance of success; and my Directors are strongly in favour of a joint application being made by reason of the unfair position in which the shareholders of sliding-scale gas companies are placed through the war, as compared with shareholders in maximum dividend gas companies, with corporation gas undertakings, and with all other industrial concerns, which can increase the price of their commodities to yield, at any rate, pre-war profits and dividends.

The gas industry has responded nobly to the call of the nation in matters connected with the war; and I have confidence in the authorities recognizing that one section of our industry should not be penalized,

as is the case at the present time, through matters over which we have no control whatever.

Mr. Paddon's suggestion does not go far enough; and this Company would like to see joint application made for authorization of payment of pre-war dividends (say the average of three pre-war years) during the war, and for twelve months thereafter, irrespective of the price of gas, and leaving the whole matter of the sliding-scale to be reconsidered (if necessary) at that time, depending on the then conditions.

Payment of increased income-tax in itself is sufficient for the shareholders to bear, as in the case of maximum dividend gas companies.

T. H. DUXBURY,
Engineer and General Manager.

South Shields Gas Company,
March 24, 1917.

Manchester University Tar Tests.

SIR,—I have had some correspondence with Prof. Lapworth, of the Manchester University, with reference to my remarks at the meeting of the Manchester Institution of Gas Engineers on the 3rd inst. He takes exception to those affecting the University; and as the condensed report that appeared in the "JOURNAL" did not quite convey what I meant, I am at his request correcting same.

The following is what I said, or meant to say: "Many engineers were dissatisfied with the tests of treated tar and oil washings carried out by the Manchester and other Universities, which gave results so diversified as to be unreliable. I do not know on whom to put the responsibility; but I called the attention of Mr. John Bond to the Stretford tests, which I was unable to accept as a correct statement of what was being done at our works. I heard of one case where the gas undertaking had divided its samples into three, two of which were sent to the University at different times, each showing different results. In my own case oil-washings had been sent to Manchester, which showed an increase in the toluol and benzol after tar-washing—results which I could not accept, as with a diminished make per ton our gas, which used to test 16 c.p., now only tested 10½ c.p. The benzol and toluol taken out to reduce the results to this extent must go somewhere. When I suggested to the University representative that the samples had been accidentally mixed, the suggestion was not received kindly. I think the system of testing requires revision."

H. KENDRICK, Engineer and Manager.

Stretford Gas-Works, March 19, 1917.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Committees on Private Bills.

Two Select Committees of the House of Lords to consider Private Bills have been appointed, to meet at 11 o'clock on the first sitting day after the Easter Recess.

The first Committee consists of the Duke of Wellington (Chairman), Earl Clarendon, Lord Ponsonby, Lord Rathcreedan, and Lord Forteviot; and among the Bills they will consider are the Kenilworth Gas Bill and the Lea Bridge District Gas Bill.

The members of the other Committee are Earl Camperdown (Chairman), Earl Eldon, Earl Ancaster, Lord Saye and Sele, and Lord Astor; and the Bills that are to come before them include the Haslemere and District Gas Bill and the Hemel Hempsted Gas Bill.

HOUSE OF COMMONS.

Gas Light and Coke Bill.

Last Thursday, the Gas Light and Coke Company's Bill, which had been referred to the House of Commons Unopposed Bills Committee, was reported, with amendments.

State Control of Coal Mines.

Mr. DUNCAN MILLAR asked the President of the Board of Trade whether he was in a position to make a statement as to the arrangements for the control and the management of coal mines by the Coal Controller.

Mr. ROBERTS replied that the Board of Trade had now assumed control of all the collieries in Great Britain and Ireland, and a department had been set up under the Controller of Coal Mines to exercise this control. An Advisory Board, representative of the coal owners and the miners in the various districts, had been attached to the Controller. It was not proposed generally to interfere in the actual management of the undertakings by their owners, who would be responsible to the Government for the safe and efficient working of the properties. It was also not proposed to interfere with the machinery already set up in various districts for dealing with disputes. The Controller of Coal Mines was now dealing with the question of the distribution of supplies with a view to securing economy of transport and of consumption of coal. The financial arrangements arising out of the control were receiving careful consideration; but he was not yet in a position to make a statement on the subject. Miners' wages were, as a general rule, based on the prices of coal. It had been agreed with the representatives of the miners that, in the event of prices falling in any district, no steps would be taken to effect a reduction of wages without the representatives of the men being first taken into consultation.

Mr. MILLAR: Have the financial arrangements yet been completed with the owners, and has any announcement been made to them direct on the subject?

Mr. ROBERTS: The matter is still under consideration, and negotiations are being opened-up with the coal owners.

MISCELLANEOUS NEWS.

GAS AFFAIRS IN SWANSEA.

Moving the adoption of the minutes of the Highways Committee at the meeting of the Swansea Corporation last week, the Chairman (Alderman T. Merrells) foreshadowed litigation with the Swansea Gas Company. The minutes stated that "the Town Clerk reported fully with regard to the negotiations which had taken place between the Sub-Committee appointed and the Directors of the Swansea Gas-light Company, and with regard to the notice which had been served upon the Company requesting them to discontinue the lighting of all public gas-lamps with the exception of the 56 lamps now being lighted. He read a letter from the Company, dated the 5th inst., stating that the matter had been placed in the hands of the Company's Solicitors to deal with."

Alderman Merrells observed that the Company had now given notice to terminate their agreement.

The Town Clerk pointed out that it was a somewhat high-handed proceeding on the part of the Company while negotiations were proceeding.

A report was also presented by the Committee with reference to the Company's "Calorific Standard" Order. It stated that while some vital points had been conceded, the Company's Solicitors had struck out the clauses containing certain points of principle for which the Corporation were contending. The Committee resolved that the Town Clerk be instructed to press for the inclusion in the Order of the terms and conditions safeguarding the interests of the Corporation now indicated by him, and that he be authorized to take whatever steps he may deem necessary to this end.

The recommendation of the Borough Surveyor that, in view of the Daylight Saving Order, the whole of the public lamps in the town should be put out altogether from April 1 to Sept. 30 was adopted.

NEWARK GAS OFFICIAL'S TRAGIC DEATH.

A mystery surrounding the sudden disappearance, shortly after Christmas last, of Mr. R. Thorpe, the Chief Cashier to the Newark Gas Company, has been cleared up by the discovery of his body, which was found last Wednesday in the River Trent, between Newark and Collingham. A watch and other articles left no doubt as to the identification of the remains. Deceased left the office of the Company on his bicycle on the morning of Dec. 29; and afterwards the machine was discovered leaning against Muskham Bridge. The Trent was in full flood at the time; and the long interval which had elapsed before the finding of the body led to the supposition that if it had been in the river it had probably washed-out to sea.

The deceased, who had proved a very efficient official, was held in high esteem; and an examination disclosed that all his books were in proper order. Evidence was given by Mr. F. B. Footitt, the Secretary of the Company, at the inquest, held on Thursday, that deceased had been in the employ of the Company for thirteen years, and for a similar number of years previously in witness's own office. Two responsible male clerks of the Company had been called to the Colours; and in consequence the deceased had been overworked. But he never complained. There had been many rumours concerning deceased's disappearance. Witness had investigated them, but did not believe any of them. The widow stated that deceased had nothing to worry him, but he slept badly and she knew that he was not well. On Dec. 29 she received from him some money and a letter, evidently pointing to his mind being unbalanced. Once talking in his sleep she remembered he said: "I don't want to go into the water yet."

The Jury returned a verdict of suicide during temporary insanity,

COMPARISONS AT BURNLEY.

In the course of the proceedings at the "Budget Meeting" of the Burnley Town Council, there was some criticism of the working of the Gas Department.

Mr. SUTCLIFFE said that four months ago he warned the Council that "all was not well in that department;" and he was going to prove it. He was not going to talk about the quality or the smell of the gas, which were obvious to everybody, but to compare the works with those at Sheffield. At the latter place, the sale of gas was £412,153; and residuals brought in £278,519. At Burnley, the figures were £100,300 and £24,250. The proportion of the sale of gas to residuals in Sheffield was just over 63 p.ct., while in Burnley it was only 24¼ p.ct. If the proportion had been as at Sheffield, the Burnley Gas-Works would have made a profit of over £43,000. Besides, Burnley had to pay 2s. 6d. per 1000 c.ft. for gas, as against 1s. 9d. for lighting and 1s. 6d. for power at Sheffield. Any reasonably minded man must come to the conclusion that there was something radically wrong at the Burnley works; and he moved that a Committee be appointed from the Council, along with the Chairman and Vice Chairman of the Gas Committee, to go thoroughly into the matter—to call in an expert, and see what was wrong. Coal was about the same price; and if they could not make gas as cheaply as Sheffield, it was time they did something.

Mr. RIPPON, who seconded, said the conditions were the same at Sheffield; and they also paid superannuation to employees, which Burnley did not. On the comparison, he thought Burnley stood in a poor light. A director of a gas undertaking had a perfect right to go over the premises; but in Burnley, a member of the Gas Committee had no more right in the works than a private individual. How could the Gas Committee be said to be responsible for the carrying-on of the works, which they were not allowed to know anything about. The

disappearance of the profits, and the general costliness of the gas, ought to be a question for inquiry.

Alderman Emmott (the Chairman of the Gas Committee) characterized the comparison as the most ridiculous ever heard. If Mr. Sutcliffe would take out the cost of gas making pure and simple—the price for coal, wages, and all expenses in connection with manufacture—he would find Burnley was making gas as cheaply as Sheffield, Widnes, or any other works in the country. Sheffield was so situated as to be able to sell residuals at probably twice as much as Burnley. Sheffield was getting half as much again for coke; and the city could use up all the residuals from the gas-works. Burnley had to send theirs away. If Sheffield had to sell the residuals on the open market, by tender, they would get no more than Burnley, where there was a difficulty in getting rid of the residuals, as the railway company would not take them.

It was ruled that the matter did not concern the estimates; and so Mr. Sutcliffe gave notice to raise the question at the next Council meeting.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.

Applications for Provisional Orders.

The Yorkshire Electric Power Company promoted a Bill in 1915 to confer upon the Company authority to supply electricity in detail for lighting purposes in those portions of their area where they only had powers to supply in bulk and where there were no Electric Lighting Provisional Orders in force. The Bill was opposed by many authorities, including several gas companies, and was not passed. The Electrical Distribution of Yorkshire, Ltd.—a Company in close connection with the Power Company—who operate Provisional Orders and buy electricity in bulk from the Power Company—have now promoted several Provisional Orders covering the areas in question; and some of these came for hearing before Mr. Garnham Roper at the Board of Trade on Tuesday and Wednesday last. Applications for Orders in respect of Clayton, Rawdon, Wortley, and Horbury were heard on Tuesday; and the cases of Otley, Rawdon, and Penistone were all taken on Wednesday.

The opposition on Tuesday was from the electrical interests of the corporations concerned; and the main grounds of objection to the Orders were: (1) That the present time was inopportune, having regard to the calls upon the energies of the objectors which war work entailed; (2) that the corporations concerned had had in view extensions of their own undertakings into the districts in question, and had not proceeded with them owing to the war; (3) that the argument of the promoters that the granting of the Orders would use surplus labour after the war was not justified; and (4) that the corporations would also have surplus generating plant installed for war purposes, the utilization of which after the war was of equal public importance to the utilization of the surplus plant of the Power Company.

On Wednesday, the opposition was from the gas companies; and the main grounds of objection were the first three set out above. In the case of the Penistone Gas Company (for whom Mr. Jacques Abady appeared) the additional ground was taken that there was no publicly expressed demand for electricity in Penistone, and that the Power Company already had power to supply electricity for power purposes. Mr. J. H. Brearley, of Longwood (the Engineer to the Penistone Gas Company) gave figures showing that the demand for gas was well met—the number of meters being considerably in excess of the number of houses, and the heating and cooking appliances almost equal. The proposed competition was obected to as being unnecessary, unfair, and prejudicial to the Gas Company in the exercise of their statutory powers.

The decision of the Board of Trade will be made known later.

Staveley Gas Company.—The balance available for dividend was, at the recent annual meeting of the shareholders, announced as being £1527, compared with £1580 this time last year, notwithstanding that the consumption of gas decreased considerably in consequence of the restricted lighting regulations. In addition, the expenditure for wages, coal, and other requisites was greatly in excess of the usual charges. Only 7 p. ct. dividend will be paid on the original shares. During the year Mr. J. W. H. Hayes, the Manager of the works, has been added to the Board as a Director.

Sulphate of Ammonia for Cottagers.—The Borough Surveyor of Reigate, by means of an advertisment headed "Fertilizers for Cottagers and Small Holders," makes the following announcement which should be much appreciated in the locality: "A quantity of sulphate of ammonia has been placed at the disposal of the Reigate Land Cultivation Committee by the Redhill Gas Company at a cost permitting of its sale in small quantities (to cottagers and small holders) at one-half the price fixed by H.M. Food Controller. In view of the probable demand, and the fact that March is the most suitable month for its application for garden crops, early application for supplies should be made."

Wanted—A Paragon.—The Burley-in-Wharfedale Urban District Council are inviting applications, from persons ineligible for military service, for a paragon, to fill the post of Surveyor, Gas and Water Manager, and Inspector of Nuisances. This composite gentleman is to manage the gas and water undertakings, have a thorough knowledge of road maintenance and the preparation of plans, specifications, and estimates of works, and be able to keep the required accounts; to carry out the duties prescribed by the Public Health, the Housing and Town Planning, and other Acts, the various Local Government Board Orders, and any others of the Board of the local Council which may come along; to hold the certificate of the Royal Sanitary Institute or other body recognized by the Local Government Board; and to devote his whole time to the work and to reside in the district. The appointment is subject to the Local Government Board sanction. The salary for this position is £140 per annum. The population of the district is 3762, and the area 3133 acres.

DAVIS GAS-STOVE COMPANY, LTD.

Annual Meeting.

The Seventeeth Annual General Meeting of the Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. H. Addis Price presiding.

The Fire at the Luton Works.

The Chairman, in moving the adoption of the report and accounts for the twelve months ended Dec. 31 last, said that the outstanding event of the year was the serious fire which occurred at the Luton works in September, and which chiefly affected the gas-stove department. Happily, the difficulties following upon this unfortunate occurrence had now been as good as surmounted; and he was glad to be able to state that, through the immediate erection of temporary buildings, and the conversion of existing warehouses into workshops, the Company were able to resume work in this department within three or four weeks of the fire—no one having meanwhile been thrown out of employment even for a single day. For this reassuring state of things, they were chiefly indebted to Mr. Harold Davis, who, in the very able manner in which he dealt with the situation so unexpectedly forced upon him, was loyally and enthusiastically supported by the Luton staff—a service which Mr. Harold Davis desired him to take this opportunity of acknowledging in the presence of the shareholders. Apart from the fire, the gas-stove business—which in ordinary times was one of their most important branches—had been further affected as a result of the war; the difficulties which were encountered in 1915 having become still more serious during the year under review. The continuous demands of the Government for fit men of military age had considerably accentuated the labour shortage, to meet which it had been necessary to utilize additional female labour—the Company now employing over 600 more women than before the war. But, while women had shown themselves very adaptable in many other branches of industry, they had not proved quite so successful in the making and fitting up of gas-stoves. Then there had been the difficulty of raw materials, upon which the Government were now exercising very drastic restrictions. Coupled with this was the fact that the Company had been of late put to very great inconvenience through delays in obtaining those of their manufacturing requirements, for the supply of which they had at present to rely on outside sources. He felt sure that the gas undertakings of the country—who, of course, constituted their principal customers—would appreciate even more than they now did the Company's efforts to execute their orders, if only they were made fully aware of the difficulties and inconveniences under which the Company had laboured, and from which they must continue to suffer in perhaps increasing measure until the termination of the war. Considering these adverse circumstances—and there were others which could be similarly dwelt upon—he thought the shareholders would agree that the Directors were very fortunate in being able to present such a satisfactory balance-sheet as that now before them. In previous years, the shareholders had unanimously endorsed the action of the Board in setting aside a portion of the profits for the purposes of a provident fund, out of which were paid pensions to retired employees, and allowances to valued servants of the Company who had responded to their country's call for men. For similar purposes, they had this year allocated a sum of £2000, which would place the provident fund in an even better position than it was twelve months ago. It was also proposed to place a sum of £4500 out of the year's profits to the credit of the reserve account, thus making a total reserve of £67,000. He now came to an item which had not appeared in previous appropriation accounts—viz., that described as "Special reserve for termination of war contingencies," to which had been allocated the sum of £4500. As to the necessity for this, their manufacturing resources were now extensively occupied on Government contracts, and the works had to a very large extent now been organized specially for this purpose. At the conclusion of the war, all Government contracts would automatically terminate, and considerable disorganization must inevitably prevail while the works were being equipped anew for resuming normal activities. It was to meet these probable conditions that the Directors had felt it necessary to create this special reserve. After the various appropriations had been made, and the proposed dividend paid, there would still remain a balance of £11,102; and this sum it was proposed to carry forward to the credit of the profit and loss account for the current year.

The Company's Financial Stability.

Mr. Cyril G. Davis said he was sure they all felt thoroughly satisfied that the balance-sheet and report bore witness to the Company's financial stability; and he therefore had much pleasure in seconding their adoption. He was able to confirm that the year had been an exceptionally onerous one, requiring considerable adaptability on the part of all concerned to meet the extraordinary conditions resulting from the war. But he thought the healthy state of the Company's accounts was sufficient evidence that they had not been found wanting in this respect. It seemed highly probable that the Government restrictions on the supply of raw materials, and the increasing labour shortage, would, before very long, prevent the manufacture of many of their standard goods—more particularly those intended for domestic use; and this must necessarily react upon the operations of the Company's sales organization. Having regard to their future interests, however, it would be false economy to restrict their selling activities to any serious extent; and the Company were therefore making the most of their facilities to push the sale of goods for which an increasing demand was being experienced as the outcome of war conditions. He referred more particularly to large gas cooking installations for staff kitchens, munition factory canteens, military hospitals, huts, and so forth, and to the phenomenal demand now existing for gas-furnaces in connection with munition work, which demand the Company were now taking a considerable hand in meeting. It might appear strange that it should have required a world war to bring home to manufacturers and others the many advantages accruing from the use of gas for industrial purposes. But it was nevertheless true that war conditions had done more in this direction than the most sanguine could have anticipated;

and it would be gratifying to the Company's shareholders to know that, when the day of victory arrived, Davis manufacturing resources would have contributed in some measure to this end. In mentioning furnaces, he would add that the Company's development of this department had enabled them to continue, even under war conditions, their scientific research work in connection with the principles underlying efficient gas heating, and that valuable additions to their knowledge were being made every day in this important branch of their activities—so much so, that many industrial heat-treatment processes hitherto considered incompatible with the economical use of gas, were now being carried out by means of furnaces specially designed and constructed by the Company, to the satisfaction of all concerned. This was especially gratifying, inasmuch as lessons learned in one connection could not fail to prove useful in elucidating other problems; and continued progress must necessarily depend upon the manner in which they utilized the fruits of their cumulative experience. But while it had thus been necessary for them to adapt themselves to unprecedented circumstances, they had to remember that these were not permanent; and it was just as essential that they should take careful thought for the time when they would have to revert to their normal trade. As to this, he might say the management were keeping themselves well informed as to popular requirements; and he had every confidence that on the return of peace they would be found equally ready to meet the entirely new conditions that must then prevail. In this connection, the shareholders would be pleased to learn that there was no falling off last year in the demand for the Company's specialities; and but for the limitations of supply resulting from war conditions and the works fire, they could undoubtedly have recorded substantial progress in this respect. The demand for their gas-fires had been greater this last year than at any time in the Company's history. That gas for domestic heating purposes had gained great popularity, there could be no doubt; and it was satisfactory to note that practically all gas-fires to-day might be considered hygienically perfect. Some of those present were aware of the strenuous efforts made by the Company as far back as 1912 to bring about the universally hygienic gas-fire; and though they were then the only makers who could satisfy the standard they themselves laid down—viz., that every gas-fire should be capable of passing all its products of combustion through its own flue-outlet, quite unaided by chimney draught, flue-pipes, &c.—most, if not all, makes of gas-fires, it was believed, were capable of complying with these conditions to-day. He would like here to interpose a word of appreciation of the courtesy and indulgence which the gas undertakings had shown in accepting the remarkable conditions which had governed the Company's relations with them during the past year. Business which these undertakings might have felt quite justified in cancelling, they had allowed to remain on the Company's books, pending ability to deliver; and it said much for the goodwill which the Company had so zealously built-up in past years, that they had not lost a single account as a result of their difficulties. It was no little satisfaction, in these trying times, to be associated in so friendly a manner with an industry which, by its very nature, was essential to the efficient conduct of the war—because, as they knew, the manufacture of coal gas furnished valuable bye-products now required in enormous and increasing quantities by the Government for the production of munitions of war; and when they thought of the millions of Davis stoves now daily facilitating the economical use of gas all over the country, they might reasonably claim that their past efforts on their own behalf were now rendering valuable assistance to the national cause. Mr. Davis concluded by referring to the loss which they had sustained in the recent death of Mr. Frank H. Porter, who was in the Company's service for upwards of thirty years. Not only was Mr. Porter's death a loss to the Company, but it was also a personal loss to the speaker himself, who was placed in his charge when he first commenced his duties with the Company, and he was perhaps on more friendly terms with Mr. Porter than were other members of the Board, by whom, however, the deceased was also held in very high esteem.

The report and accounts having been adopted, a dividend for the half year was declared on the ordinary shares at the rate of 15 p.ct. per annum, making 10 p.ct. for the year, less income-tax.

Mr. Harold N. Davis was re-elected to his position as a Managing-Director; both mover and seconder referring in terms of great appreciation to his services on the occasion to the fire at the works.

Gas Manager and Exemption.—At a sitting of the North Riding Appeal Tribunal at Northallerton last week, the Military representative appealed against the decision of the local Tribunal in granting conditional exemption to the Manager of the Northallerton Gas Company. He is 27 years of age and unmarried. The Company formerly had a staff of eight men. Three were of military age, and two had joined the Army. Conditional exemption was granted until July 31, on the understanding that an effort is made to secure a substitute not of military age.

A Board of Trade Electric Power Committee.—At last week's meeting of the London County Council it was reported that the President of the Board of Trade is appointing a Departmental Committee to consider and report what steps should be taken (whether by legislation or otherwise) to ensure that there shall be an adequate and economical supply of electric power for all classes of consumers in the United Kingdom—particularly industries which depend upon a cheap supply of power for their proper development. Having in view the position of the Council in the matter, the President considered it important that the Council should be represented on the Committee, and suggested that they should nominate Mr. G. H. Hume as a member. Having regard to the knowledge of the question which Mr. Hume possesses as it affects London, the General Purposes Committee of the Council recommended that he be nominated on the Departmental Committee, "on the understanding that the Council is by such representation in no way committed as to its policy in the matter."

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EDINBURGH AND LEITH GAS COMMISSIONERS.

Air-Raid Warnings.—Separation Allowances.

It was reported at the last meeting of the Edinburgh and Leith Gas Commissioners, with regard to air-raid warnings, that the Engineer (Mr. Alexander Masterton) had communicated with the Chief Constables of Edinburgh, Leith, and the county, stating that the Commissioners would be glad if they would take action on similar lines to those of last year, by giving due notice in the papers and by circular. The Chief Constable of the city has since issued his instructions (brought up to date), which do not materially differ from those given a year ago [see "Journal," Vol. CXXXIV., p. 291]. In his annual report, issued recently, he stated that while, as a rule, the previous orders were well observed by the citizens, the police had difficulty in successfully enforcing them—due not so much to wilful disregard of the law as from carelessness and neglect. He reminded the public that while the restrictions in regard to public lighting, &c., of necessity imposed upon everyone a certain amount of inconvenience, these emergency measures were adopted for the purpose of ensuring the safety of the public; and, consequently, for some people to offend against the regulations was but to endanger their own safety and that of their fellow-citizens.

The Commissioners also discussed the question as to whether their allowances to men on active service should be reduced to the extent of the recent increases in the rates of separation allowances payable for the children of soldiers and sailors. At present the Commissioners make up the difference between the salary or wages paid at the time of enlistment and the man's military pay and allowances, *plus* 7s. per week in the case of married men and men with dependants. It was pointed out that a grievance exists, in respect that the allowance in the case of a man who joined the Colours at the beginning of the war is less than that granted to one who enlisted at a later stage, owing to wages having increased in the interim; and it was considered that advantage might be taken of the present opportunity for rectifying this grievance as far as possible. It was resolved to follow the practice of the Edinburgh Corporation—viz., "that in each case the new Government allowance granted to the dependants be taken into account and deducted from the Corporation allowance hitherto paid to these dependants; but in every case where the man's class or grade has since his enlistment received an increase of wages from the Corporation, the deduction of separation allowance will be reduced to the extent of that increase of wages."

The Engineer reported that many common-stair gas-jets in Leith had been tampered with—the excuse given being that the illumination was so poor from flat flame burners that those who made use of the stairs could not see to get about. It was decided to suggest to the Leith Corporation the advisability of dispensing with jets regulated to consume one cubic foot of gas per hour, or, as a better alternative, to have incandescent burners installed, as in Edinburgh.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 26.

There is a good demand for pitch in the London market, and during the past week business has been reported at 30s. per ton net in bulk at makers' works. The freight question, however, presents considerable difficulty. Creosote is firm, and business is said to have been done at 4¼d. per gallon net in bulk at makers' work. Solvent naphtha continues steady. There is a moderate demand for pyridine bases, and from 4s. 3d. to 4s. 6d. per gallon net into buyers' drums is at present obtainable. All available supplies of sulphate of ammonia are being readily taken up for home consumption.

Tar Products in the Provinces.

March 26.

Markets for tar products remain the same. There are one or two inquiries from France for pitch, but contracts are difficult to arrange. Solvent and heavy naphthas are steady.

The average values of gas-works products during the week were: Gas-works coal tar, 20s. 3d. to 24s. 3d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s., Liverpool 16s. 6d. to 17s., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6¼d. to 6½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3⅜d. Heavy oils, in bulk, North, 3⅜d. to 4d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

Sulphate of Ammonia in the Provinces.

Liverpool, *March* 24.

The values fixed for fertilizers in Great Britain and Ireland have remained without alteration at £16 per ton to farmers and £15 10s. to mixers and distributors, net cash in makers' bags, carriage paid to consumers' station. Export licences are still unobtainable, and prices for shipment abroad are entirely nominal.

Nitrate of Soda.

This market has continued steady throughout the week, and spot values are unchanged at 24s. per cwt. for ordinary quality, and 24s. 3d. for refined.

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COAL TRADE REPORT.

Northern Coal Trade.

There is a good deal of irregularity in the coal trade. Collieries have some idle time, because of the scarcity of prompt steamers, and the uncertainty of forward contracts; while the fact that there is some attempt to encourage enlistment again has its effect on the output. In the steam coal trade, best Northumbrians are about 30s. per ton f.o.b.; for second-class steams, the current quotation is from 22s. to 24s. 6d.; and steam smalls are quiet at from 17s. to 19s. 6d., according to the class. In the Durham coal trade, the demand is good for this season. In the gas coal branch, the quotations are well maintained, though much of the material is being delivered on long contracts at or near the "controlled" prices. Best Durham coal is from 24s. to 25s. per ton f.o.b.; second-class quality is near 17s. to 19s; and for "Wear specials" the quotation is from 30s. to 31s. There is a steady demand for gas coal, as stocks have been reduced in the cold weather, and the holidays that are now near will lessen the output. Very high freights have had to be paid of late to obtain steamers for gas coal—over 20s. Tyne to London having been recorded. Coking coal is in good request; and this has its influence on the gas coal trade. New contracts are now being made only slowly, though some for large quantities should at this time be in the market. Gas coke may be quoted as about 31s. to 32s. 6d. per ton f.o.b., according to the port of shipment. The freight on coke from the Tyne to France is from 45s. to 45s. 6d. to the northern ports.

Damages for Gas-Works Nuisance.

At a recent sitting of the Cheadle County Court, before his Honour Judge Ruegg, K.C., and a Jury, Mrs. Martha Rushton sued the Cheadle Gas Company in respect of damage alleged to have been caused to her garden, &c., by the overflow of gas-works products. Mr. H. G. Farrant (for plaintiff)stated that gas tar and ammoniacal liquor had been allowed to find their way through the wall dividing the Company's land from that of the plaintiff. It was a continuing nuisance. The defendants and their servants had frequently been warned, but had persistently omitted to take any steps to remedy it. The land was absolutely useless for cultivation. About two years ago, the plaintiff's tenant could grow potatoes and other things on it; but now it was permanently ruined. The defendants had made two payments of 10s. to the tenant. The area damaged was practically 1190 square yards. The plaintiff raised the question of the nuisance in March, 1915, when opposing an application by the Company to the Board of Trade for a Provisional Order; but the objection was withdrawn on the promise of the Secretary that they would remedy the mischief. Evidence having been given in support of the plaintiff's case, it was urged, for the defence, that nothing had oozed through the wall. Mr. R. Walker (the Company's Manager) stated that since he had been there the tenant had not complained. The Jury fixed the damages at £6, and judgment was entered accordingly, with costs.

Tottenham Tribunal Cases.

At the Tottenham Tribunal last Wednesday, Mr. A. E. Broadberry the Engineer and Manager of the Tottenham District Light, Heat, and Power Company, mentioned the cases of a number of men in the Company's employ. He emphasized the necessity of the supply of gas being maintained, and said that any failure in it would affect the needs of the army. The Company employed 746 men. Of these 532 were free from any obligation for military service, leaving 214 liable. The Company had released 325 for service, and were making up their army pay and allowances to the wages they received when at work. They had paid £10,000 under this head to the wives and families of men serving. They also employed 115 women. There were 9 men under 23 who had been classed "A;" and he would release them as soon as possible. In regard to the general body of employees, Mr. Broadberry said that the Ministry of Munitions had informed him that calling-up notices received by the Company's employees should be returned to the Recruiting Officer. In view of this intimation, he would withdraw all the cases before the Tribunal. The Chief Military Representative remarked that he had received no such intimation. The Chairman said that, in view of Mr. Broadberry's letter, they had no alternative but to allow him to withdraw the cases.

Rise in Price at Andover.—The Directors of the Andover Gas Company have notified consumers that the price of gas is to be raised 4d. per 1000 c.ft., owing to the continuing increase in the cost of production. They state that the 10 p.ct. rise in the price of gas in July, 1915, has proved quite inadequate in meeting the ever-increasing cost of raw materials and all other goods necessary in the carrying on of the undertaking.

Swansea Public Lighting Question.—At a meeting of the Swansea Corporation, the Borough Surveyor reported with regard to the times of lighting public lamps during the summer months, and suggested that, in view of the probability of daylight saving again coming into operation in April this year, the whole of the public street-lamps, both electric and gas, should be put out altogether during the period from April 1 to Sept. 30. It was resolved that this recommendation be approved; and the Surveyor was instructed to communicate with the Chief Constable with a view to carrying the proposal into effect.

Prosecuted for Staying away from Work.—The Doncaster Corporation last week prosecuted a gas worker for having broken his contract of service with his employers. The Town Clerk (Mr. R. A. H. Tovey) said very great inconvenience had been caused at the gas-works by men absenting themselves from their work. On more than one occasion the works had very nearly been brought to a stoppage. Defendant's excuse was that he had to work in water which came over the tops of his boots. He gave an undertaking to return to his work and stick to it; and on this consideration, he was let off on paying the cost of the summons.

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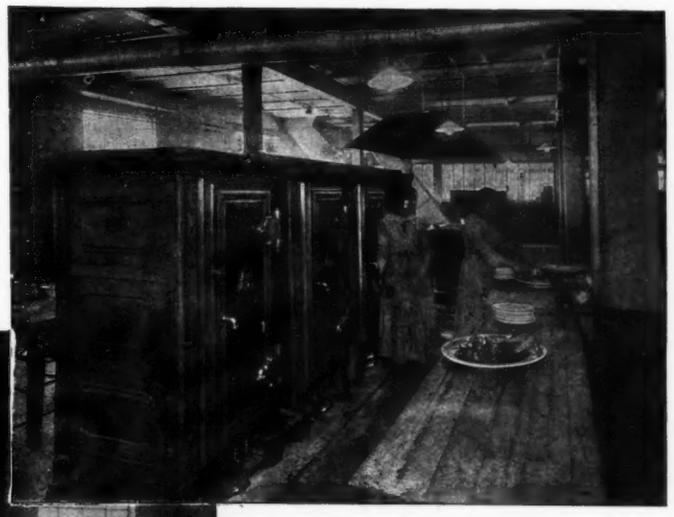

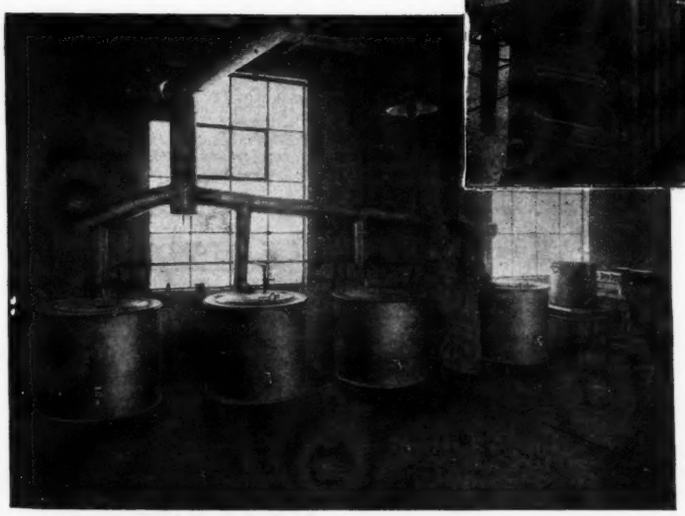

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Gas Charges to be Reconsidered at Rochdale.

At the last meeting of the Gas Committee at Rochdale the question of increased charges for gas to all classes of consumers was informally discussed; a report presented by Mr. T. B. Ball, the Gas Engineer, showing that owing to increased cost of materials, wages, and bonuses, there was little likelihood of anything being available from the gas profits for the relief of the rates. The year 1915-16 was the first in the history of the undertaking that nothing was available for rate relief. In consequence of this, the price of gas to ordinary consumers was raised from 2s. 6d. to 3s. per 1000 c.ft., users for power purposes also being affected from 6d. to 8d. per 1000 c.ft., according to consumption. Prior to 1915, the price of gas had not been as high as 3s. per 1000 c.ft. since 1903; but in 1882-3-4 it reached 3s. 6d., and fell the next year to 3s. 3d. At last Wednesday's meeting the Engineer also reported that it was becoming increasingly difficult to secure delivery of coal for gas making.

Breach of a Sulphate of Ammonia Contract.

The House of Lords have delivered judgment in the case of *Watts, Watts, & Co.* v. *Mitsui & Co.* [see "Journal" for Feb. 8, 1916, p. 315, and July 4, p. 30], which related to a cargo, of 3500 tons, of sulphate of ammonia that was to have been carried in the appellants' steamer from Marioupol, in the Sea of Azov, to Japan. On the outbreak of the war, the shipowners refused to send the steamer; and they were sued for alleged breach of the charter. The appellants said that performance of the contract became impossible; but the respondents urged that at the date of the breach this was not so. Their Lordships decided in favour of the respondents for a sum of £3800, less the cost of insurance, which made the amount £800. Costs were allowed except as to the House of Lords. The Lord Chancellor said that the reason given by the appellants for the cancelling of the charter was that the British Government had prohibited steamers from going into the Black Sea to load; but, in fact, there had been no such prohibition. The claim of the respondents to enhance the damages by reference to a supposed fall in the market at Marioupol at the time of the breach must fail, as there was no evidence that the goods could be obtained from any person other than the Evence Coppée Company (the respondents' vendors), or that there was any market at Marioupol for such goods. The Court of Appeal were wrong in directing an inquiry as to damages on a basis for which no foundation had been laid by the evidence; and the judgment of Mr. Justice Bailhache was correct.

Reduced Consumption at Oldham.—At the last meeting of the Oldham Gas Committee it was reported that there was a decrease of 104½ million c.ft. in the gas consumed since March 25 last year, equal to 6·47 p.ct.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 21.]

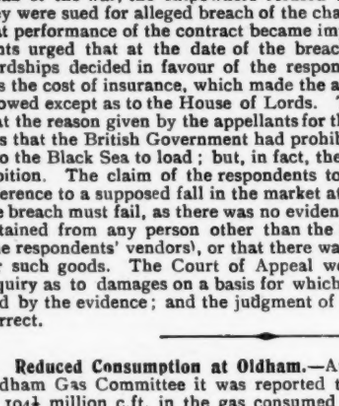
Nos. 3568—3924.

Best, C. E.—"Withdrawing gas from retorts." No. 3661.
Black, H. C. M.—"Pipe joints or couplings." No. 3621.
Clements, A. B.—"Boring, drilling, and tapping machines." Nos. 3635, 3636.
Hall, I.—"Gas-fired furnaces." No. 3746.
Harvey, G. & A.—See Clements. Nos. 3635, 3636.
Ionides, A. C.—"Complete combustion of gaseous mixtures." No. 3611.
Jackson, W. J.—"Preventing escape of gas from gas-generators." No. 3716.
Soc. C. M. Stein et Cie.—See Jackson. No. 3716.
Somerville, J. M.—"Gas-meters." No. 3704.
South Metropolitan Gas Company.—See Somerville. No. 3704.

Carriage of Benzol and Petrol.

At the Bow County Court last Friday week, his Honour Judge Graham, K.C., delivered a considered judgment in a case in which the Great Northern Railway Company sued Messrs. Carless, Capel, and Leonard, to recover £1 0s. 11d. for carriage of some benzol and petrol. The facts were that in 1906 the plaintiffs and other railway companies came to an agreement with the defendants as to the rates to be charged for the carriage of petrol in 3-ton loads between certain towns. The defendants paid these rates until 1913, when the plaintiffs raised them by 4 p.ct., believing themselves entitled to do so pursuant to the Act of that year. Defendants objected, and had since paid the additional 4.ct. under protest. Plaintiffs further urged that petrol came under the heading in the Act of 1891 of "Dangerous goods," in respect of which they were entitled to charge such reasonable sum as they might think fit in each case. With respect to this point, his Honour said he thought the plaintiffs were in the right. With regard to the right to add 4 p.ct. under the 1913 Act, this appeared to have been decided by the Court of Appeal in the portland cement case. There was no evidence before him that there had been any such changes in the cost of working railways as would make 4 p.ct. unreasonable to-day if it was reasonable when that case was tried. Judgment was entered for the plaintiffs, with leave to appeal.

An official telegram received in Amsterdam from Berlin on Monday of last week stated that "one of our naval aeroplanes on Saturday afternoon dropped bombs on the gas-works at Dover."



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Yorktown and Blackwater Gas Company.—In their report for the year ended Dec. 31 the Directors stated that the higher price of coal, labour, and materials, with the extra expense incurred in carrying out the desires of the Ministry of Munitions, coupled with diminutions in the sale of gas caused by daylight saving and the restriction of lighting, had reduced the profits. The receipts on revenue amounted to £22,006, and the gross expenditure was £18,312, the balance carried forward being £3694. After paying all charges there was an available sum of £9331, and the Directors recommended the statutory dividends on the different classes of shares.

Windsor Royal Gas Light Company.—It was reported by the Directors at the half-yearly meeting that, though the high price of coal continued, the Company were still able to supply gas at pre-war figures, and also pay full statutory dividends. The Chairman (Mr. W. B. Holderness) said the make of gas for the whole year totalled over 120 million cubic feet; the private sales showing an increase of 15 millions over what they were five years ago. The increase was due principally to the very large number of gas-fires fixed, together with the growing use of prepayment meters. Dividends were declared for the half year ended Dec. 31 at the rate per annum of 5 p.ct. on the preference shares, 10 p.ct. on the ordinary shares, and 7 p.ct. on the new shares.

Drogheda Gas Undertaking.—A letter submitted to the Irish Local Government Board, in reply to criticisms by the Auditor of the Drogheda Corporation accounts, states that the financial condition of the gas department is not as satisfactory as it was prior to the war; but the general financial conditions in the town differ in no way from those of other towns, where freight charges have had serious effects. The calculations in regard to the price of coke are based on the state of the market throughout the United Kingdom. The price of coke in Drogheda was always extremely low—50 p.ct. under prices ruling in other towns; so that, while the increases made from time to time have not brought the prices up to those in other places, there had been a proportionate increase. In pre-war days, the price was 16s. 8d. per ton; the present price is 35s. The Council actually refused on one occasion to adopt the full recommendation of the Gas Committee to increase coke prices. In respect to the collection of revenue from the gas undertaking, the letter, which is signed by the Town Clerk, mentions that a resolution had been passed ordering that accounts are no longer to remain in arrear beyond one quarter. If an account has not been paid before the next one falls due, legal proceedings must be taken. The Council have approved plans and estimates, &c., for the erection of coal-storage plant.

STOCK MARKET REPORT.

THE Stock Exchange was almost dead-quiet last week, in a state of semi-suspended animation. The word of command was given for dealings in War Loan to begin, and, according to arrangements already notified, the market opened yesterday. Meanwhile, the patriotic House, having received the thanks of Mr. Neville Chamberlain for their despatch in envelope addressing, were commanding further gratitude by doing some book-keeping for the same authority. Operations in the War Loan will probably be hampered for awhile, owing to the fact that there were no fewer than eight distinct classes of the security quoted; but this unavoidable sub-division will disappear as soon as they are *ex div.* Then it is to be hoped that the huge issue may practically constitute a strong market by itself.

As a result of last week's working, prices for the most part took an easier line, and the factor of a shortage of stock was still in operation. In the gilt-edged market, all Home Government issues (other than 6 p.ct. Exchequer Bonds) went down before the War Loan position. Colonials, however, were in good request. Home Rails started well, but tailed-off before the finish. The American Market was irregular, and mostly rather dull. Argentines were more hopeful. The Foreign Market was unchanged in tone; Chinese, Japanese, and Brazilians being firmest, and Scandinavian making a show again. South Africans were very fair. Among the rest, Rubber was again firm, and Textiles, Shipping, and Banks did fairly well.

Business in the Gas Market was on a moderate scale, and destitute of any feature of intense interest. But the prices at which some issues of considerable importance, and influential in giving a predominant tone to the market, changed hands, indicated a tendency to greater strength. Debenture issues were again in demand. The Money Market was in a state of pronounced ease. The election of the Stock Exchange Committee on Tuesday resulted in the defeat of the anti-bank party. It is to be hoped that some satisfactory *modus vivendi* in future may be devised—continued friction will only be harmful, both to the House and to the public.

Bargains done for cash during the week were as follows: On Monday, Derby 96, 96⅜, Gas Light ordinary 65, 65¾, Imperial Continental, 67, 67⅛, 68⅛, Metropolitan of Melbourne 99¾, South Metropolitan 75. On Tuesday, Commercial 4 p.ct. 73, Gas Light ordinary 65⅛, 65⅜, 66, ditto debenture 54¾, Imperial Continental 68½, ditto debenture 59¾, 60, South Metropolitan 75. On Wednesday, British 33⅛, 34 1/16, Gas Light ordinary 65⅛, 65¼, 65⅜, 66, 66¼, ditto debenture 55, 55⅛, Hastings debenture 55⅛, 55½, Imperial Continental debenture 59¾, 60. On Thursday, Brentford "A" 83, 83½, European 10 3/32, 10⅛, 10⅜, Gas Light ordinary 65½, 66, 66⅛, ditto preference 70, Imperial Continental 67, ditto debenture 59¾, 60, South Metropolitan 74⅛. On Friday, Brentford "A" 83, 83½, British debentures (Norwich) 67¼, European 10½, Gas Light ordinary 66, 66⅛, 66¼, 66½, ditto preference 69⅜, 70, Imperial Continental 66, ditto debenture 59½, Primitiva debenture 79, 79½, South Metropolitan 75⅛, 75⅜. On Saturday, Gas Light ordinary 66⅜, 66½.

The Bank rate is 5½ p.ct., as fixed on the 18th of January.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	58—63*	..
1,551 858	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	62—64	..
574,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅛—6⅜	4⅜—5⅛	..
50,000	10	Feb. 26	16	15/-		24—30	24—26*	..
3-3,110	10	,,	7	7/-	Bournemouth Gas and Water { B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	15—15½	10⅜—11⅛*	..
115,000	10	,,	6	6/-		13½—14	9⅛—9⅜	..
159,740	—	—	—	4%		..	71—73	..
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid.	261—266	83—85	83—83½
734 920	,,	,,	11	53/9	Do. B New	204—209	80—83	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	83—88	..
221 400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	67—69	..
217 380	,,	Feb. 26	11	10⅝	Brighton & Hove Orig.	208—213	157—161*	..
244,200	,,	,,	8	7⅞	Do. A Ord. Stk.	154—159	112—117*	..
530 000	20	Mar. 26	12½	22/6	British	44—45	33¾—34⅛	33 3/4—34 1/16
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245.771	,,	,,	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	57—60	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1¼—1¾	..
103.030	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5	..
103,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157.150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79½—80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	71—73	73
563 000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103—105	65—68	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	36—38	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	58—60	..
278,400	,,	—	—	11½%	Croydon B and C 7 p.c.	..	170—180*	..
—	—	—	—	10⅜	Do. E	..	..	..
472,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100*	96—96⅜
55.000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,032,180	10	July 29	10	7/6	European, Ltd.	17½—18	10—11	10 5/16—10½
16 313 480	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds	98—102	65—67	65—65½
2,600 000	,,	,,	3½	3½%		76—79	54—57	..
4,062,235	,,	,,	4	4%		96—99	69—71	69⅜—70
4,674 850	,,	June 11	3	3%		72½—74½	54—56	54½—55½
130,000	,,	,,	10	10%		..	..	..
2 8,740	,,	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	76—81*	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	8—9	..
26,600	—	—	—	9½%	Hornsey 7 p.c.	..	120—130*	..
131,000	Stk.	Mar. 12	7⅛	7⅛%	Ilford A and C.	151—154	102—107*	..
65,780	,,	,,	6⅛	5⅞%	Do. B	115—118	80—85*	..
65.500	,,	June 26	4	4%	Do. 4 p.c. Deb	92—94	71—74	..
4,910,000	,,	May 14	9	4½%	Imperial Continental	150—160	66—71	66—68½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	58—61	59½—60
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	85—90*	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A B	211—213 / 146—148	81—83	..
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	3⅞—4⅛	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—100	99½
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11⅛—12	8—8⅛	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98⅛—99½	73½—74⅛	..
529,705	,,	June 26	3¼	3¼%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7½	North Middlesex 7 p.c.	14—15	10—11*	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	105—107	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅛—7⅜	2—3	..
60.000	50	Feb. 26	13	12½	Portsea, Island B	128—131	92—97	..
100,000	50	,,	12	11%	Do. C	118—121	86—90	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	1⅞—2⅛	..
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅛—5	55/—65/-	..
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	79—79½
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10⅛—11	8—8⅜	..
125,000	50	July 1	5	5%		47—49	42—44	..
135,030	Stk.	Mar. 12	10	10%	Sheffield A	223—224	180—190*	..
202,984	,,	,,	10	10%	Do. B	222—224	180—190*	..
523 590	,,	,,	10	10%	Do. C	220—222	170—180*	..
90,000	10	May 28	9	6/-	South African	10⅛—11⅛	..	..
6,609,893	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	74—76	74½—75⅜
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72⅜—74⅛	54—56	..
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	144—146	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	7 —78*	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	77—79*	..
195 000	—	—	—	48/4	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	77—79	..
120 000	,,	Feb. 12	7½	7½%	Tottenham { A 5 p.c. B 3½ p.c.	135—138	95—100	..
782 275	,,	,,	6	5⅞%	District { 4 p.c. Deb.	115—117	68—73	..
181 255	,,	June 26	4	4%		87—89	65—67	..
182 380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	91—92	..
30,000	,,	Feb. 26	8⅜	80/-	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	114—119*	..
215 636	,,	,,	6¼	65/-	Do. B 3½ p.c.	129—134	99—101*	..
108 075	,,	,,	5/17/8	56/-	Do. C 3½ p.c.	110—115	86—91*	..
352,000	,,	,,	6½	58/9	Wimbledon 5 p.c.	117—122	88—93*	..
98,000	,,	,,	6⅜	65/-	Epsom 5 p.c.	121—126	96—101*	..
834 6	..	June 26	3	3%	3 p.c. Deb. Stk.	66—69	51—54	..

* Ex. div.

Ilford Gas Company.

Mr. William Ashmole, presiding at the half-yearly meeting of the Company, told the proprietors that the Directors had made sufficiently large contracts for coal to carry the undertaking on for a considerable time; and unless there was any unforeseen hitch with regard to transit, there should be no fear for their supplies. When it was realized that a few years ago the whole of the coal required was put into store direct from barges, whereas to-day every ton had to be carted from the station, it would be seen that the question of cartage had been a difficulty with them. The cost of coal for the half year ended Dec. 31 was £19,886, or an increase of £1791 over the corresponding half of the previous year. The actual amount carbonized was 374 tons less. Less had been spent on oil; but this was owing to the fact that a smaller quantity of carburetted water gas had been made. The total output of gas during the half year showed an increase of 2·7 p.ct. over the corresponding period. The increased use of gas appliances—particularly fires—had more than compensated for the loss due to the restricted lighting. The Directors much regretted having been obliged to raise the price of gas from 2s. 11d. to 3s. 2d. per 1000 c.ft. at Christmas. The total revenue amounted to £49,484; the expenditure being £40,885. This left a balance to carry to profit and loss account of £8599. After providing for interest charges, the sum available for dividend was £26,627, out of which the Directors recommended the payment of a dividend for the half year (less income-tax) at the rate per annum of 7⅜ p.ct. on the "A" and "C" stocks and 5¼ p.ct. on the "B" stock—leaving a balance of £19,864 to be carried forward.

Dartmouth Gas Company.—The report adopted at the annual meeting of the Company stated that the profit for the year amounted to £989. After charging interest on debentures and first preference shares, and carrying a sum of £100 to the suspense account, there remained a net balance available out of which the Directors recommended dividends of 5 p.ct. on the second preference shares and 6s. 6d. per share on the ordinary shares, both less income-tax.

Gas Profits at Darlington.—It was reported to the Gas Committee of the Darlington Town Council last Friday that the net profit for the year was £3327, as compared with £7740 in the previous year. The costs had increased by £8000; while, on the other hand, gas and coke produced £2825 more than last year. There was a balance brought forward from last year of £2240, which, with this year's estimated profit, made a total of £5477. It was decided to recommend that £3000 should be given to the relief of the rates and £2477 transferred to the reserve account.

Double Gas Fatality at Leeds.—A husband and wife have been found dead in bed, at a house in Bristol Road, Leeds, as the result of coal-gas poisoning. It is said that gas was escaping from a pipe in the cellar connecting the meter with a gas-cooker. A small light was burning in the bedroom at the time the bodies were discovered. At the inquest, a Gas Department official said the deceased man had evidently fixed some flexible piping to the cooker supply; and there was no stop-tap in the scullery. The whole connection had been done in a very amateurish way. "Accidental death" was the verdict.

Condition of the Haverhill Gas-Works.—Following on the recent breakdown of the Haverhill gas supply, it will be remembered that the Council decided to secure the assistance of an expert. Mr. J. W. Auchterlonie, of Cambridge, was called in; and he has since submitted his report to the Gas Committee. Various suggestions he made are now receiving careful attention. Mr. Auchterlonie dealt in detail with the different portions of the works, concluding with the statement that "the most important and costly parts—the retorts, purifiers, and holders—are at the present time ample in size, and in good condition."

Bexhill Water and Gas Company.—The report of the Directors for the past half year states that there is a balance at the credit of the profit and loss account available for dividend of £8143. They recommend that a dividend be declared for the six months at the rate of 6½ p.ct. per annum on the capital authorized by the Acts of 1885 and 1892, at the rate of £4 11s. p.ct. per annum on the capital authorized by the Act of 1896, Order of 1901, and Act of 1904, and at the rate of 5 p.ct. per annum on the preference share capital—less income-tax. This, with provision for income-tax, will absorb £4130, leaving £4013 to be carried forward to the next account. The increase in the revenue is, they add, satisfactory.

The Hackney "Preferential Charge" Case.—In the matter of contributions now being voted by various local authorities to the Hackney Borough Council towards the expenses incurred in defending the "undue preference" action brought by the Gas Light and Coke Company, the Lighting Committee of the Barnes Urban District Council report, regarding the proposal to grant £20, that the Local Government Board state that they are not aware of any legal authority enabling the Council to make such a contribution. The Board add that they do not think they could properly undertake to sanction expenditure of the kind so as to withdraw it from the jurisdiction of the District Auditor at the annual audit.

The Selas-Turner Company has been registered, with a capital of £20,000 in £1 shares, to carry on business as gas lighting, heating, and electrical engineers, under an agreement with Mr. H. Smith. The Company is a private one, with offices at Coventry.

A fire occurred at the Admiralty, Whitehall, early last Saturday. The newspaper report says the fire is believed to have been caused by a short-circuit while charging accumulators—at any rate, fifty of these were destroyed, which rather gives support to the belief.

At last week's meeting of the Heywood Town Council it was decided not to contribute anything towards the Hackney undue preference appeal case—a reaffirmation of a previous minute upon the subject, but brought up again for consideration by the receipt of a further letter upon the matter from the Hackney authorities.

At the last meeting of the Hebden Bridge and Mytholmroyd Gas Board's financial year a vote of thanks was accorded to Mr. James Simpson for presiding over the proceedings. In acknowledging this, Mr. Simpson (who has, with the exception of one year, been Chairman ever since the undertaking was purchased by the two Councils), warned the members that he would not be prepared to accept nomination for the post another year.

It has been reported to the Glasgow Corporation by Mr. Alex. Wilson (the Gas Manager) that at the Provan and Temple gas-works there is plant which had been previously utilized for the manufacture of oil gas, and which, in view of present requirements, could be adapted for the manufacture of carburetted water gas. He was instructed to obtain tenders for executing the work of reconstructing this old plant, and making it suitable to manufacture water gas.

The Ardrossan Town Council have put in a trial installation of eighteen "A. & M." patent pressure-wave automatic controllers complete with "Edinburgh" pattern hurricane-proof lanterns; and when tested, the system proved a great success. Referring to the matter, the "Ardrossan and Saltcoats Herald" says that "the Council and Mr. A. Dow (the Gas Manager) are to be congratulated upon their progressive policy; and the result of their experiment should encourage them to extend the system throughout the burgh."

The Committee of the British Westinghouse Company's Employees' War Relief Fund, in presenting the balance-sheet to Dec. 31 last, feel that some explanation should be given as to the apparently large balance (£13,528) shown to be in hand. The fatalities to date number 168; and it is impossible to estimate what increase there will be to that in the future. It is estimated that the sum of £14,000, invested at 4 p.ct., would be sufficient to pay 5s. per week for 5½ years to only 200 families, and so it is not only necessary to conserve the big amount of the present balance, but to further augment it, in view of the probable increase in the losses of men.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

The public are informed that newspapers and other printed publications will not be sent to Neutral Countries unless they are posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

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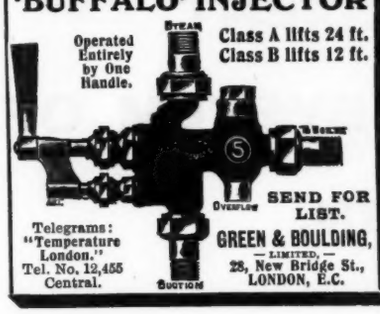
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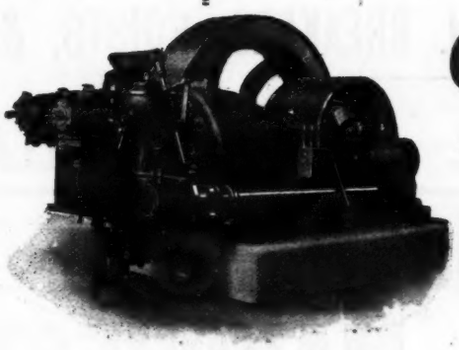

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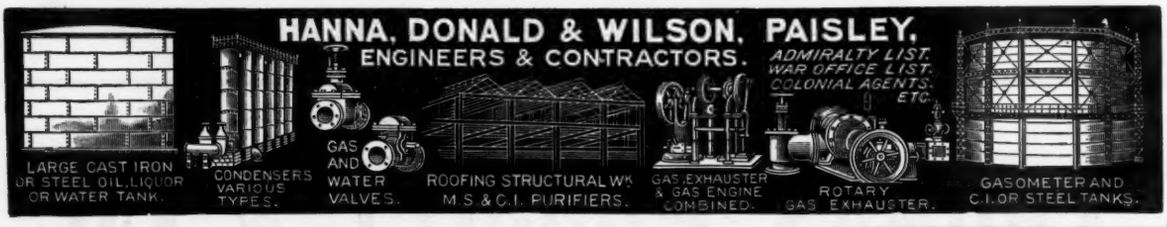
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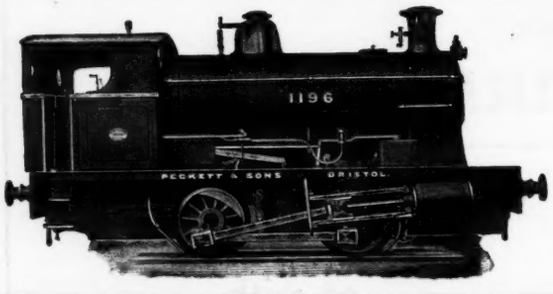

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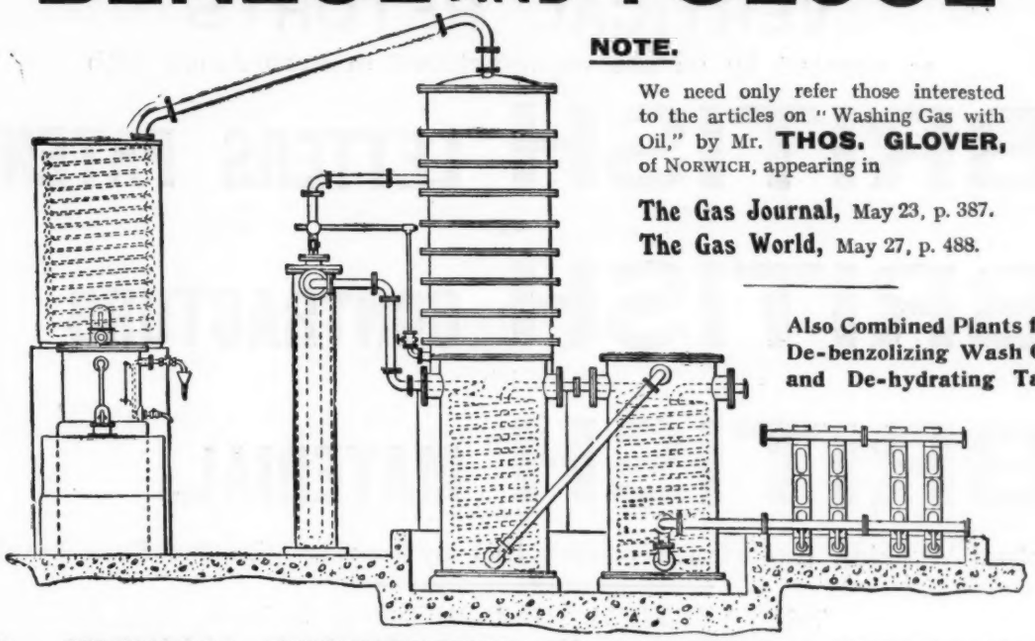

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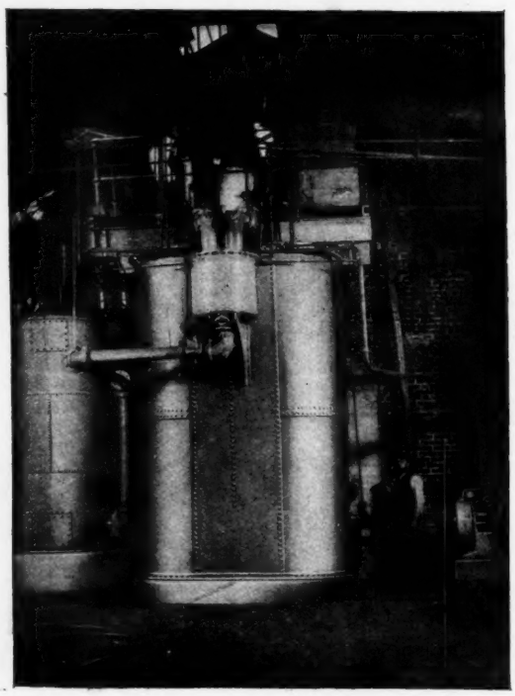

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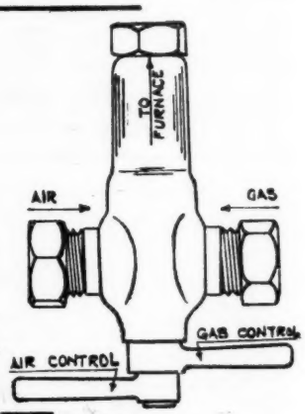

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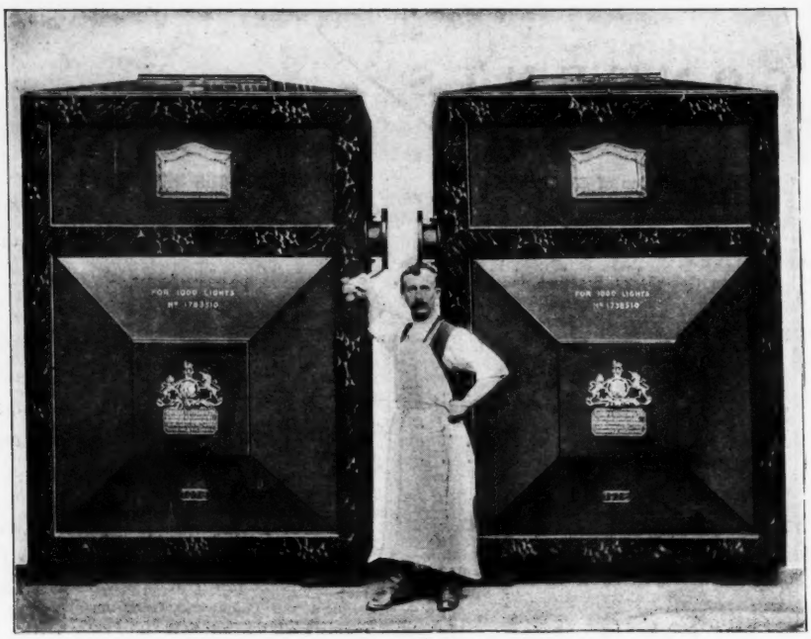

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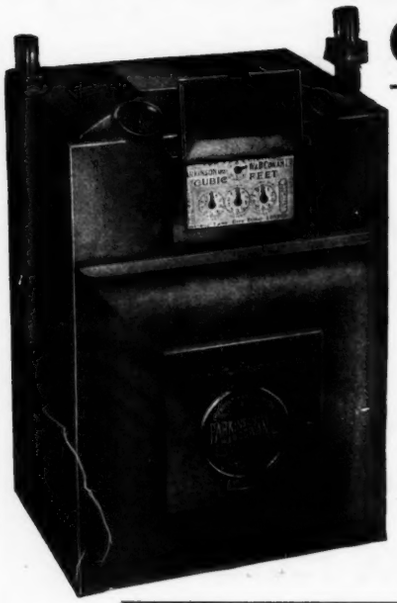

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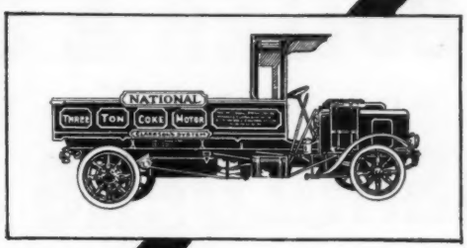

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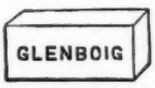
TRADE 

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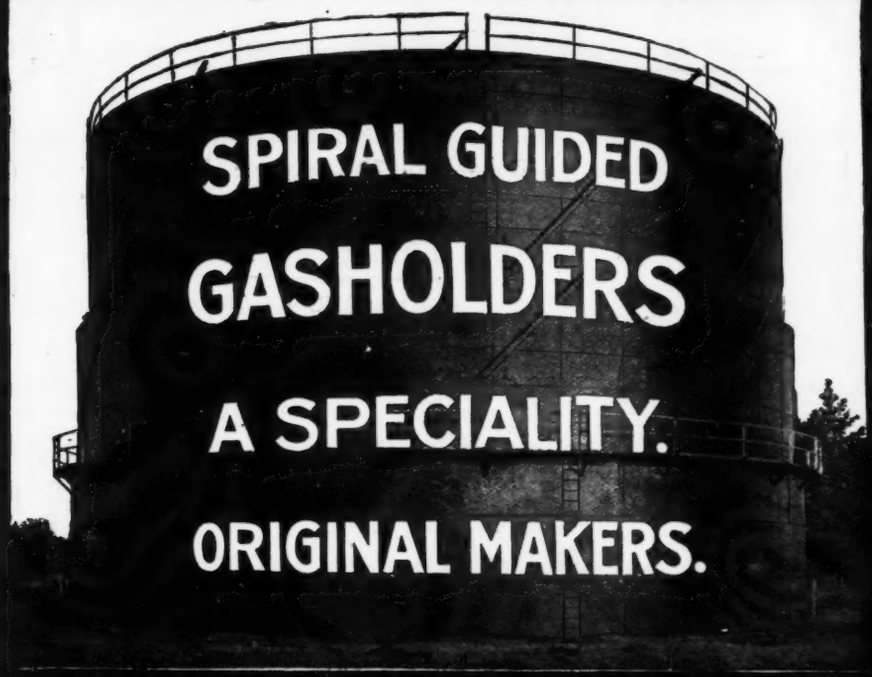

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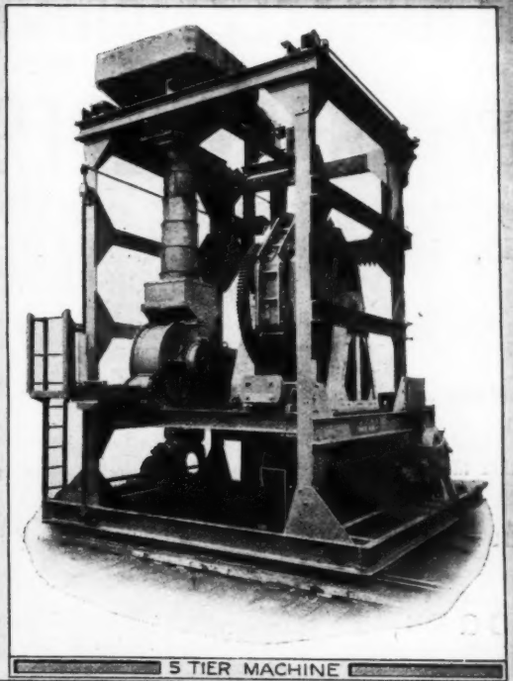

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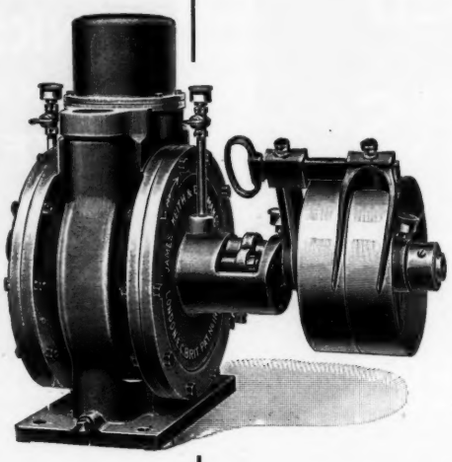

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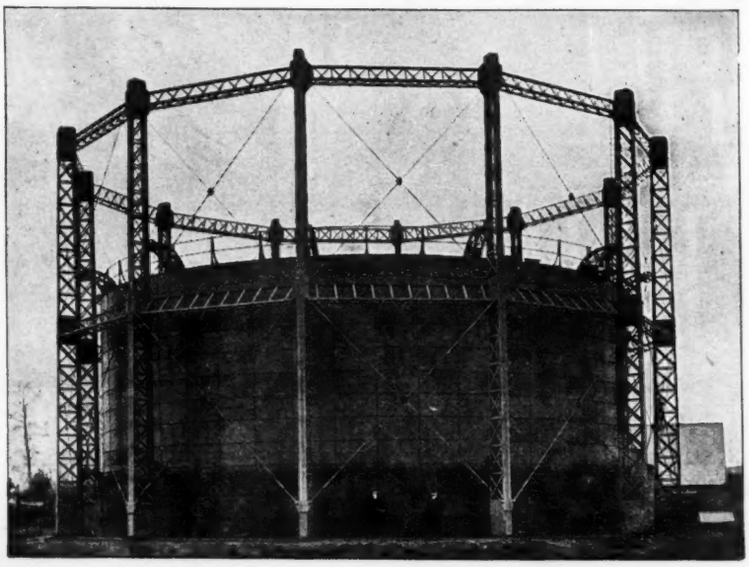

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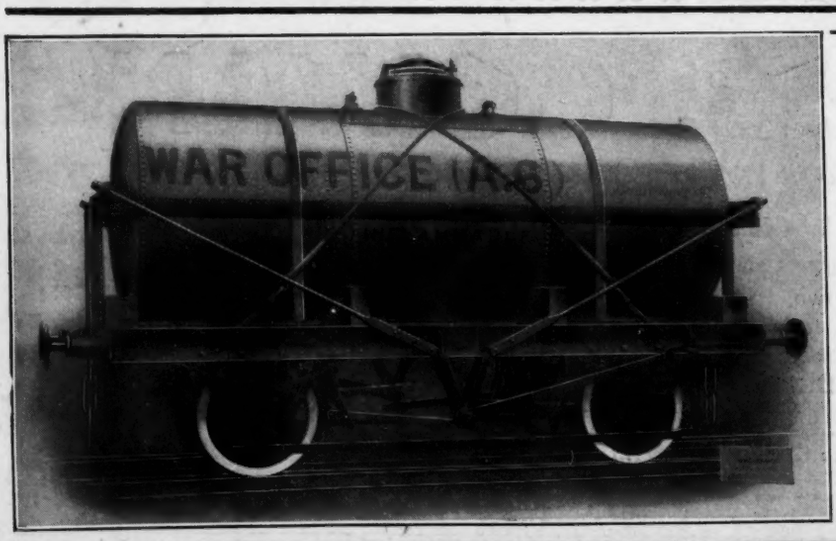

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